GLOBE Country Coordinator Implementation Guide

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Table of Contents

1. ***The Role of the Country Coordinator***

2. ***Types of Country Coordinators***

3. ***School Selection and Support***

4. ***The Costs of Implementing GLOBE***

5. ***Private Sector Support for GLOBE International Partners***

6. ***Organizations Involved in GLOBE Activities***

7. ***GLOBE Science Measurements and Scientific Instruments***

    - ***7.1 Summary of GLOBE Science Protocols***
    - ***7.2 GLOBE Measurements and Instruments***
    - ***7.3 Scientific Instruments for GLOBE Measurements***
    - ***7.4 GLOBE Instrument Specifications***
    - ***7.5 Scientific Instrument Vendors***
    - ***7.6 GLOBE's Science Objectives and Use of Data***

8. ***Coordinated Science Selection Process***

9. ***GLOBE Training and Support***

10. ***Who is a GLOBE Teacher***

11. ***GLOBE Master Trainers***

12. ***GLOBE Training Website***

13. ***GLOBE Landsat 7 Policy***

14. ***GLOBE's Approach to Ensuring Data Quality***

15. International Training Workshop Site Requirements

16. Information on GLOBE Logo and Trademarks

17. GLOBE IDs and Passwords

- *17.1 Training Workshop IDs*
- *17.2 Process for Obtaining Country Coordinator IDs*
- *17.3 Process for Obtaining School IDs*
- *17.4 Instructions for Changing School Passwords*

18. Country Coordinator Administration Pages

19. Data Entry Quick Reference

20. Spreadsheet E-Mail Data Entry Instructions

21. Looking At Data – Visualization Quick Reference

22. GLOBE E-Mail Listservs

23. Information Requirements for GLOBE Stars, Bulletin, Announcements…

24. Writing A GLOBE News Release

25. List of GLOBE-Related URLs

26. GLOBE Partner Best Practices

1. The Role of the Country Coordinator

The GLOBE Country Coordinator is appointed by the Government Organization responsible for GLOBE in each GLOBE Partner Country. The GLOBE Country Coordinator is responsible for the day-to-day management of GLOBE in that country, usually including recruiting schools, organizing training sessions, program oversight, etc. Almost all of the Country Coordinators have other responsibilities in addition to GLOBE.

The initial step for implementing GLOBE in a country is for the Country Coordinator to attend a Basic and Advanced GLOBE International Training Workshop session. This seven day Basic (5 days) and Advanced (2 days) International Training Workshop event is the first step in the train-the-trainer process that allows the Country Coordinator and any other GLOBE trainers to train GLOBE teachers in their country. In order to ensure the accuracy of the GLOBE data for use by the world science community, each GLOBE school must have a GLOBE teacher trained in guiding students in taking the measurements. GLOBE International Training Workshops provide training to GLOBE trainers in the conduct of GLOBE environmental measurements according to the measurement protocols developed by GLOBE scientists, the reporting of GLOBE data, the use of GLOBE educational materials and learning activities, and the use of the GLOBE Website.

The Country Coordinator selects GLOBE schools, and following participation in a GLOBE International Training Workshop, trains at least one teacher in each of the schools in the GLOBE protocols and the various aspects of the GLOBE Program. The Country Coordinator provides assistance to the schools in the acquisition of resources they need to participate in the GLOBE Program. (See Tab 3 - School Selection and Support)

After training GLOBE teachers, the Country Coordinator sends completed GLOBE school profile forms to the Assistant Director for International Programs certifying that the GLOBE teacher(s) has been trained to supervise GLOBE activities and requests a GLOBE school ID for each school. This can be done automatically by Country Coordinators using the GLOBE website, or by faxing them to the GLOBE Office. If these requests are faxed to GLOBE, the GLOBE Office will process these requests and send the new school IDs to the Country Coordinators to provide to the new GLOBE schools. The Country Coordinator also keeps the GLOBE schools up-to-date on program matters, answers their questions, and addresses their concerns. The workload can be intensive when the country is beginning its participation in GLOBE, but generally decreases after the schools are trained and have initiated GLOBE activities.

The role of the Country Coordinator is of critical importance to the overall success of a country's GLOBE Program. The Country Coordinator acts as the point of contact for all GLOBE schools in his/her country. This is necessary for many reasons, but mainly so that the Country

Coordinator, as the individual responsible for GLOBE in that country, is aware of questions and/or problems schools are facing in their implementation of the GLOBE Program. With this awareness, the Country Coordinator can identify issues facing his/her schools and develop strategies to avoid similar problems in the future. In addition, it is quicker and more efficient to obtain answers locally or nationally than from the GLOBE Office in the U.S. This procedure for addressing schools' problems and concerns provides an opportunity for interaction between the Country Coordinator and the GLOBE schools and helps to establish relationships between the various individuals involved in the country's GLOBE Program.

Country Coordinators have adopted a variety of mechanisms for providing ongoing support to and communicating with their GLOBE schools. For example, the Czech Republic publishes a newsletter on a regular basis to keep its schools informed of GLOBE activities around the world. In Croatia, schools take turns writing and publishing a GLOBE newsletter that provides updates to all of the GLOBE schools and answers frequently asked questions relating to GLOBE in Croatia. Other Country Coordinators have developed different ways to keep communications flowing with their GLOBE schools. For example, Australia has used a newsletter and also created an e-mail based listserv which allowed the Country Coordinator to send messages to all of the GLOBE schools simultaneously. Nepal and Germany have also created e-mail user groups to coordinate GLOBE activities in their countries. Additionally, Costa Rica, The Netherlands, and the United Kingdom developed their own GLOBE Home Page to provide information pertaining to GLOBE schools in that country. Links to these GLOBE Home Pages are provided from the GLOBE website from their country pages.

2. Types of Country Coordinators

Government Organization: Frequently, the government organization responsible for GLOBE will select a Country Coordinator from within its ministry or department. In some countries, the Ministry of Education is the Country Coordinator because this Ministry is responsible for all in-school programs, such as in Egypt. In other countries, the GLOBE Country Coordinator is from the Ministry of Environment because this agency has the role of overseeing environmental education, such as in Israel. GLOBE has also been implemented by the Ministry of Science and Technology because of the importance of introducing technology in the classroom, as in the case of Thailand.

Nongovernmental Organization (NGOs): The Country Coordinator need not be from the government. Although the government organization that signs the GLOBE agreement is responsible for selecting a Country Coordinator, in many cases, a Country Coordinator is chosen from outside the government. In these cases, the government often selects an NGO with which they have existing relationships and/or an NGO which is known to already have relationships with schools. For example, in Ecuador, the NGO OIKOS had an established relationship with both the Ministry of Education and the Environmental Agency. In the Czech Republic, the NGO TEREZA was selected to act as the Country Coordinator because of its experience and strong reputation for high quality environmental education programs for students. In Nepal, a local NGO named ECCA was selected to implement GLOBE partly because of their experience in working with remote communities.

University: Individuals from universities are also commonly selected to serve as GLOBE Country Coordinators. This strategy has worked well in countries where the universities selected have the ability to provide computer and Internet support or scientific training and support to schools. In Japan, Greece, Ireland, New Zealand and Argentina, universities were selected as the Country Coordinating organizations.

Teachers: Occasionally, teachers with significant environmental education or Internet training are selected as the GLOBE Country Coordinator for an entire country. For example, Country Coordinators in Iceland, Denmark and Cape Verde are teachers, and Norway pulled together a team of teachers to implement GLOBE. Teachers have been extremely effective Country Coordinators when they have the support of their school administration.

3. School Selection and Support

Each GLOBE partner country is responsible for selecting its schools that will participate in GLOBE. It is up to the Country Coordinator to train at least one teacher in every GLOBE school who is certified to supervise GLOBE activities at their school. Frequently, the schools selected to participate in GLOBE receive assistance from the Country Coordinator in acquiring scientific instruments, computer equipment or Internet connectivity, either via the provision of government resources or by securing resources from other sources.

There are a variety of ways in which schools are selected and resources are obtained by GLOBE schools. They are:

Geographic Regions: Some countries choose schools by geographic region. China, Portugal and the Philippines, for example, selected one GLOBE school from each province. These selected schools serve as GLOBE hubs for other schools in the province in coordination with the provincial and local environmental offices. China plans to establish provincial GLOBE Offices throughout China. Similarly, Spain identified a GLOBE contact in each of its Autonomous Communities to be trained as a GLOBE Trainer to train and follow-up with schools in their community. Initially, South Africa selected five to ten schools in each province, and at least five of the schools in each South African province are historically disadvantaged schools with limited resources which received support from the Department of Arts, Culture, Science and Technology for their GLOBE activities.

Competition: Partners establish competitive means for schools to apply to become GLOBE schools. Under this mechanism, only qualified entrants based on established criteria become GLOBE schools. For example, in Greece, schools from a wide geographic region and from all levels of education applied and competed against a set of established criteria. Several hundred schools applied and 24 schools were selected.

Self-Select: Many countries advertise the GLOBE Program and schools which express an interest in participating are allowed to join the program. For example, the Netherlands, Finland and Turkey use this approach.

Availability of Resources: Some partners provide resources to schools and others select schools that can support their own participation in GLOBE. In Portugal, the Ministry of Environment supported the purchase of instruments and equipment for its first six GLOBE schools. In other countries, such as Turkey, schools are selected based on their access to resources such as computers, Internet connectivity and scientific instruments. And, some countries have received support for their GLOBE activities from the private sector (See Tab 5-Private Sector Support for GLOBE International Partners).

Relationship with Nongovernmental Organizations and Universities*:* In countries where NGOs and universities serve as the GLOBE Country Coordinators, schools that have existing relationships with these organizations, or are located nearby, are frequently selected to become GLOBE schools. For example, in the Czech Republic, TEREZA, an environmental education NGO acts as the GLOBE Country Coordinator. TEREZA had relationships with schools and

children's groups around the country prior to taking on leadership of GLOBE, and these schools were selected to participate in the GLOBE Program. India is also focusing on the implementation of GLOBE in schools located near certain NGOs that were selected by the Ministry of Environment and Forests to help with the implementation of GLOBE.

Environmental Clubs: Some GLOBE Partners utilize existing after-school environmental clubs to expand the GLOBE Program. Japan, for example, has chosen to implement GLOBE in both schools and in Eco Clubs. Furthermore, in Turkey, GLOBE activities are done as part of after-school environmental clubs.

4. The Costs of Implementing GLOBE

There are a number of categories of costs, all of which may not be solely applicable to the GLOBE Program. The costs depend on how the GLOBE Partner country chooses to implement the GLOBE Program and the level of resources currently available in its schools. For example, if a GLOBE Partner decides to select schools to participate in GLOBE which already have computers and Internet, then it need not figure in the expense of computers and Internet into the GLOBE costs. Also, if the schools utilize various scientific equipment they already have, or schools choose to make some of the scientific instruments by hand, then these costs can also be reduced dramatically. That being said, below are the potential categories of costs related to the implementation of the GLOBE Program:

Support for a Country Coordinator: This person is appointed by the government of the GLOBE Partner Country and s/he is responsible for the day-to-day management of GLOBE in that country, usually including recruiting schools, organizing training sessions, program oversight, etc. In some of our partner countries, this person comes from within the sponsoring ministry; in other countries, an NGO or university is asked to take on this responsibility. Almost all of the Country Coordinators have other responsibilities in addition to GLOBE. The bulk of the Country Coordinator's work is initiating the program; i.e., the Country Coordinator attends a seven day GLOBE International Training Workshop, selects GLOBE schools, trains the teachers in those schools, and may help those schools acquire the necessary equipment to participate in GLOBE. After that, the Country Coordinator keeps the GLOBE schools up to date on program matters, answers their questions, and/or addresses their concerns. The workload, therefore, is intensive when the country is adding new schools to the GLOBE Program, but decreases after the teachers are trained and schools have begun their GLOBE activities.

Computers and Internet connectivity: These costs vary from country to country and depend on the number of new computers and Internet connections in which the GLOBE Partner wants to invest and how many are necessary to meet the Partner's implementation objectives. While it is highly desirable that each GLOBE school has a computer with an Internet connection, it is also acceptable for a country to arrange to collect data in any way, so long as the Country Coordinator sends, or arranges to send, the data to GLOBE through the Internet.

Scientific instruments: This cost varies greatly. The program provides specifications for the instruments required to take a core set of environmental measurements in the following scientific discipline areas: Atmosphere/Climate, Hydrology, Soils, and Land Cover/Biology. However, there are a number of items that can be handmade or can be substituted with already available equipment. For example, to take the soil moisture measurements, a school could purchase a balance for weighing soil and an oven for drying it, or the school could use a balance and a drying oven already available at the school or at a nearby school. Another option would be to use a kitchen oven for drying the soil. Thus, the difference in cost for GLOBE instruments between the least and the most expensive approach can be hundreds of dollars. Having said that, the average cost to a school for instruments are:

Primary school level: $400
Middle school level: $500
Secondary school level: $600

It should be emphasized that the equipment covered by these costs permit schools to do all of the GLOBE measurements and to produce quality data that will be entered into the data archive. All of the equipment does not necessarily have to be purchased at one time or at all. Often times we have seen schools make handmade instruments with instructions provided in the GLOBE Teacher's Guide or borrow instruments that are available nearby, thereby decreasing costs. It should also be mentioned that the equipment prices above do not include shipping costs.

Teacher training: There are two costs in this category. First is the cost to send the Country Coordinator (and other trainers if they so choose) to a one-week GLOBE International Basic Training Workshop, and a two-day International Advanced Training Workshop (which typically follows directly after the International Basic Training Workshop previously mentioned). The cost for this depends on the workshop location. These workshops are held in numerous regions of the world throughout the year. Second is the cost to train at least one teacher from each school chosen by the GLOBE Partner to participate in the GLOBE Program. Again, this cost varies depending upon the approach used and size of the country. Often, the GLOBE Partner includes GLOBE training in workshops that are already being provided to its teachers at a central location; this negates the need for more travel to a separate GLOBE workshop and therefore, reduces the training costs. Some Partners, such as the United Kingdom and Australia, train teachers of their schools.

5. Private Sector Support for GLOBE International Partners

To date, we have seen at least five different scenarios for private sector support of the GLOBE Program internationally: In-kind contributions; "Adopt-a-School;" Sole Sponsorship; Teacher Training; and Ongoing Teacher/Student Support. Following is a brief description of each.

In-Kind Contributions. Companies provide computer hardware and other equipment to schools to enable their participation in GLOBE. For example, AT&T donated computers to 10 GLOBE schools in Benin; DEC provided computers to several participating GLOBE schools in the Czech Republic; GBM, an IBM subsidiary, donated computers and Internet connections to GLOBE schools in El Salvador; Microsoft donated Internet connections for schools in Egypt; Huger Electronics provided automated weather stations to Germany's GLOBE schools; Dynamic Network Technologies, an Internet provider in Chisinau, Moldova, provided Internet connectivity for all GLOBE schools for one year. Also, Bank Windhoek donated computers to several Namibian GLOBE schools with UUNET Internet Africa, which is providing a dedicated lease line for 3 years for the use by Namibian GLOBE schools.

"Adopt-a-School ". Companies provide all the support necessary for a school to participate in GLOBE, i.e., funding scientific equipment, computers, Internet connections and teacher training. For example, in Egypt, IBM Egypt and ORASCOM Foods (an Egyptian company) each adopted a school and, in addition, has played a continuing "mentoring" role with the students.

Sole and Joint Sponsorship. Companies decide they want to make a broader investment in the country's GLOBE effort by becoming a sole sponsor of the program for a defined period of time. For example, Ameritech signed an agreement with China's National Environmental Protection Agency to fund all the costs associated with the implementation of the Program for the first five years, including fully supporting up to 36 schools (funding scientific equipment, computers, Internet connections and teacher training).

Train the Trainer and Teacher Training and Support. Companies provide funding and in-kind support for GLOBE Teacher Training Workshops and other events in their region. For example, Mobil Oil provided support for a GLOBE Training Workshop in Kazakhstan, including computer hardware, communications and networking capabilities, and scientific instruments. In addition, Central Asian Business Systems, a subsidiary of IBM, lent computers for use during the Kazakhstan International Training Workshop, as did Mercantile (an online service provider) in Kathmandu, Nepal.

Ongoing Teacher/Student Support. Mobil provided support for the Country Coordinator and 16 teachers involved in GLOBE in China to attend the GLOBE Learning Expedition -- GLOBE's first international student-teacher conference in Helsinki, Finland, June 30 - July 4, 1998. The SAS and Coca-Cola Environmental Foundation have contributed over $5,000 for GLOBE school-to-school collaboration between Norway and Estonia.

We are sure that many new scenarios of corporate involvement in GLOBE will emerge worldwide over the coming years as the international dimensions of the program evolve. It is becoming apparent to us that companies see their contributions to GLOBE not only as being in

their self-interest, but also as valid contributions to education, environmental awareness, use of technology and development in their host countries.

6. Organizations Involved in GLOBE Activities

Many Governmental and Nongovernmental Organizations have provided support for GLOBE activities in countries throughout the world where GLOBE meets program objectives for the host country. For example, Peace Corps staff and volunteers in Kazakhstan, the Czech Republic, the Russian Far East, Benin, and many other countries in Africa have assisted in the implementation of the program both nationally by supporting the Country Coordinator in implementing the program and locally by working with their counterpart teachers in individual schools.

The US Agency for International Development (USAID) has also helped to implement GLOBE in countries where USAID has perceived GLOBE as being consistent with its goals for the country. For example, USAID in Benin has helped organize and conduct teacher-training workshops, has funded translation of the GLOBE Country Coordinator's Guide into French and has provided Internet ready computers at the USAID office for GLOBE student data transmission. USAID has provided facilities for International GLOBE Training Workshops, including computers and Internet connections. Finally, USAID funded the Beninese GLOBE Coordinator's participation in GLOBE annual conferences from 1997 - 2001, funded Beninese GLOBE teachers' participation in GLOBE training workshops in other African countries -- like Senegal -- and funded the Beninese Country Coordinator and two students' participation in GLOBE's first international student-teacher conference in Helsinki, Finland, in July 1998.

USAID's GREENCom has provided staff support and training for the GLOBE Country Coordinator and teachers in Jordan and Russia. USAID's Leland Initiative, which worked to bring the Internet to Sub-Saharan Africa, used GLOBE as a direct application of Internet technology and worked together with GLOBE on training workshops in Sub-Saharan Africa. USAID's United States – Asia Environmental Partnership (US-AEP) program has also provided support in some GLOBE countries to implement GLOBE and promote environmental awareness.

In December 1994, the United Nations General Assembly passed a resolution encouraging all nations to participate and all UN organizations to support GLOBE activities around the world. Since that time, the GLOBE Program has established formal relationships with the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations High Commissioner for Refugees (UNHCR) to engage in mutually beneficial activities. UNHCR has seen GLOBE as a vehicle for environmental education in refugee camps throughout Africa, and is therefore supporting GLOBE in Kenya and Senegal in camps as well as in schools neighboring the refugee camps and in urban schools with high refugee populations. Also, the GLOBE Program and the United Nations Environmental Programme (UNEP) have agreed to cooperate on environmental education and training and the collection of environmental data. Through this partnership, GLOBE and UNEP share educational materials and promote collaboration of UNEP regional offices with GLOBE countries in their regions. In addition to being a general resource for environmental education, UNEP provides GLOBE Country Coordinators access to their networks of scientists.

GLOBE also has established both formal and informal relationships with Nongovernmental Organizations (NGO) to support and promote each other where the programs' goals overlap.

A small sample of the types of organizations discussed above are listed on the following pages. We anticipate additional organizations with programs relevant to GLOBE Partners will be identified in the future. This list is meant as a starting point for identifying potential collaborators on GLOBE activities.

I*EARN
475 Riverside Drive, Room 540
New York, NY 10115
Phone: (212)870-2693
E-mail: iearn@iearn.org
Web site: www.iearn.org

KidsGLOBE
PO Box 451
Southport, CT 06490-0451
Phone: (909)595-9346
E-mail: BGarcia763@aol.com
Web site: www.kidsglobe.com

Peace Corps
Contact the Peace Corps Country Director via the U.S. Embassy in-country.

Sister Cities International
120 South Payne Street
Alexandria, VA 22314
USA
Phone: (703) 836-3535
Fax: (703) 836-4815
Web site: http://www.sister-cities.org

Soros Foundation
Open Society Institute - New York
888 7th Avenue
New York, N.Y. 10106
United States of America
Phone: (212) 757-2323
Fax: (212) 974-0367
Web site: http://www.soros.org/

UNDP - United Nations Development Program
Contact Regional Offices or UNDP Headquarters at:
One United Nations Plaza
New York, NY 10017,
Phone: (212) 906 5000
Fax: (212) 906 5001
Web site: http://www.undp.org/

UNEP - United Nations Environment Program
Contact Regional Offices or UNEP Headquarters at:
Room DC2-803, 2 United Nations Plaza
New York, N.Y. 10017 U.S.A.
Phone: (1 202) 963-9138/8139
Fax: (1 202) 963-7341

UNESCO - United Nations Education, Science and Culture Organization
7, place de Fontenoy
75352 Paris 07-SP
France
Phone : (33) 01 45 68 18 78
Fax : (33) 01 45 68 55 40
Telex : 204461 Paris ; 270602 Paris Telegrammes : UNESCO Paris
Web site: http://www.unesco.org/

UNHCR - United Nations High Commissioner for Refugees
Case Postale 2500
CH-1211 Geneva
2 Depot
Switzerland
Phone: (41) 22739-9111
Fax: (41) 22739-7374

United States – Asia Environmental Partnership
US-AEP, Asia/Near East Bureau
U.S. Agency for International Development
1300 Pennsylvania Avenue, NW, 4th Floor
Washington, DC 20523-4101
Tel: 1-202-712-4156
Fax: 1-202-216-3379
Web site: www.usaep.org

USAID - U.S. Agency for International Development
Contact the USAID Office via the U.S. Embassy in-country or via the USAID headquarters at:
320 21st Street, N.W.
Washington, D.C. 20523-0016
Phone: 202-647-1850
FAX: 202-647-8321
Web site: http://www.info.usaid.gov/about/

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7. GLOBE Science Measurements and Scientific Instruments

Information regarding GLOBE measurements, necessary scientific instruments and required instrument specifications are provided in the GLOBE Teacher's Guide. Copies of these items follow.

7.1 Summary of GLOBE Science Protocols

7.2 GLOBE Measurements and Instruments

7.3 Scientific Instruments for GLOBE Measurements

7.4 GLOBE Instrument Specifications

7.5 Scientific Instrument Vendors

7.6 GLOBE's Science Objectives and Use of Data

7.1 Summary of GLOBE Science Protocols: Basic and Advanced

The set of GLOBE measurements reflects the Program's commitment to provide the education community with a rich suite of protocols that meet their various curriculum needs while also providing scientifically useful environmental data. The student data can be used to address local needs and interests, the global study of the Earth system, and to support student research projects. All schools are encouraged to participate in the full range of GLOBE environmental measurements. Such broad participation results in a comprehensive dataset which is more useful scientifically and educationally because the different measurements complement one another and provides a more complete characterization of the local environment. However, each teacher should undertake only those measurements which support the educational objectives of their individual class. Instrument costs vary, depending on the optional methodologies selected and on equipment already available; estimated instrument costs are approximately: $450 for Basic Protocols and an additional $450 for Advanced Protocols. Some protocols are only recommended for middle and secondary schools.

In the past year of conducting GLOBE International Training Workshops around the world, we have received many comments and suggestions regarding the fairly overwhelming amount of material presented. As a result, we have re-evaluated our approach to conducting GLOBE Train-the-Trainer Workshops internationally and decided to make some fundamental changes to increase the effectiveness of our training approach. Please see the section on GLOBE Training and Support for details.

As GLOBE Partners, you of course have the flexibility to organize your workshops quite differently, perhaps involving separate workshop sessions that take place over a longer period of time. Regardless of how you organize your workshops, however, you will now also be able to present GLOBE Teacher Certificates to the participants at your workshops after they have been trained in any GLOBE Protocol (see "Who is a GLOBE Teacher" section for more details). And we encourage you to continue to work with them after that point in order to present all Protocols.

GLOBE SCIENCE PROTOCOLS

LOCATION

SUMMARY: At all sites at which GLOBE measurements are taken, the latitude, longitude, and elevation are determined to within 30 meters.

> Description: Students determine latitude, longitude, and elevation using hand-held Global Positioning System (GPS) receivers.
>
> Instrument: GPS receiver (GLOBE loans GPS receivers to schools for short periods of time or they can be borrowed or purchased locally)

ATMOSPHERE/CLIMATE

SUMMARY: Students monitor atmospheric conditions every day. All measurements may be taken at a site adjacent to the school. Many measurements are taken within one hour of local solar noon, although some measurements may be taken at other times throughout the day. Instruments that measure daily high, low, and current temperatures, amounts of precipitation, and ozone concentrations are installed at this site. Other instruments are brought to the site as needed while some instruments are used in the classroom.

CLOUD COVER and CLOUD TYPE (Basic)

Description: Students report the amount of cloud cover and the types of clouds present.

Instrument: GLOBE Cloud Chart in the UN languages (provided by GLOBE)

AEROSOL (Advanced)

Description: Students measure the amount of sunlight coming through the atmosphere.

Instrument: GLOBE Sun Photometer

BAROMETRIC PRESSURE (Advanced)

Description: Students report the actual pressure at their school once per day in support of the Aerosol measurement.

Instrument: Aneroid barometer or altimeter

RELATIVE HUMIDITY (Advanced)

Description: Students report the relative humidity at their school once per day.

Instrument: Sling psychrometer or digital hygrometer

PRECIPITATION, LIQUID (Basic)

Description: Students report the depth of liquid precipitation accumulated in the rain gauge during the previous 24-hour period and the pH of this precipitation.

Instruments: Rain gauge, pH measuring equipment

PRECIPITATION, SOLID (Basic)

Description: Students report the depth of new snow, the total depth of accumulated snow, and the rain equivalent depth and pH of both the new and accumulated snow.

Instruments: Snow board, depth pole or meter stick, rain gauge, containers for snow samples, and pH measuring equipment

AIR TEMPERATURE (Basic)

Description: Students report the maximum and minimum temperatures over the previous 24-hour period along with the current temperature.

Instruments: Maximum/minimum thermometer, calibration thermometer, instrument shelter (maybe locally built)

OZONE (Advanced)

Description: Students measure the concentration of ambient ozone by exposing an ozone sensitive strip to the air for one hour.

Instrument: Ozone strip scanner and ozone test strips

HYDROLOGY

SUMMARY: Students take weekly measurements of surface water properties at a near-by water body (river, stream, bay, ocean, lake, pond, etc.) which serves as their hydrology study site.

WATER TRANSPARENCY (Basic)

Description: Students measure the transparency of the water at their study site.

Instrument: Secchi Disk or transparency tube (may be locally built)

WATER TEMPERATURE (Basic)

Description: Students measure water temperature at their study site.

Instrument: Organic-liquid filled thermometer (identical to the calibration thermometer)

DISSOLVED OXYGEN (Advanced)

Description: Middle and secondary school students report the concentration of oxygen dissolved in the water at their study site.

Instrument: Dissolved oxygen chemical test kit

WATER pH (Basic)

Description: Students measure the pH of the water at their study site.

Instrument: pH pen, or pH meter and calibration buffer solutions or pH paper

ELECTRICAL CONDUCTIVITY (Basic)

Description: Students report the conductivity of the water at their study site (for fresh water sites).

Instrument: Conductivity (total dissolved solids) meter

SALINITY (Basic)

Description: Students measure the salinity of the water at their study site (for brackish or salt water sites).

Instrument: Hydrometer or optional salinity chemical test kit

ALKALINITY (Advanced)

Description: Middle and secondary school students measure the alkalinity of the water at their study site.

Instrument: Alkalinity chemical test kit

NITRATES (Advanced)

Description: Middle and secondary school students measure the nitrate and nitrite concentration of the water at their study site.

Instrument: Nitrate chemical test kit

SOILS

SUMMARY: Students measure soil moisture and temperature at a study site near their school. Students characterize the top meter of soil at this and other sample sites

SOIL TEMPERATURE (Basic)

Description: Students measure soil temperature at least weekly.

Instrument: Soil thermometer

SOIL MOISTURE (Basic)

Students measure the water content of multiple soil samples collected 12 times each year from their study site. An optional technique may be employed by advanced students to take daily observations from four depths.

Instruments: Soil cans or other containers, digging tools and a balance; gypsum blocks and a soil moisture meter for an optional soil moisture protocol

SOIL CHARACTERIZATION (Basic except particle density, particle size distribution, and fertility which are Advanced)

Description: Students determine the top and bottom depth of soil horizons (layers), and the structure, color, consistence, texture, and presence of rocks, roots, and carbonates, bulk density, particle density, particle size distribution, pH, and fertility of each horizon found within the top meter of soil at their sample site. Each site is characterized only once.

Instruments: Clinometer (locally made), color chart, sample cans, hydrometer, plastic 500 mL graduated cylinder, volumetric flasks, hot pad, organic-liquid filled thermometer, pH measuring equipment, soil fertility kit, digging tools

LAND COVER/BIOLOGY

SUMMARY: Students assess the land cover of a 15 km by 15 km area (their GLOBE Study Site) centered on their school.

QUALITATIVE LAND COVER ASSESSMENT (Basic)

Description: Students classify the land cover at multiple 90 m by 90 m homogeneous sample sites located within their GLOBE Study Site.

Instruments: Tubular densiometer and clinometer (locally made), Modified UNESCO Classification System (MUC) Field Guide and Glossary of Terms, camera, compass, 50 meter tape measure

QUANTITATIVE LAND COVER ASSESSMENT (Basic)

Description: Students perform a quantitative assessment of the vegetation in 90 m by 90 m sample sites classified as forest, woodland, or grassland.

Instruments: Tubular densiometer and clinometer (locally made), compass, 50-meter tape, camera, Modified UNESCO Classification System (MUC) Field Guide and Glossary of Terms; plus local tree identification guides (forests and woodlands) or paper bags, grass shears, and low-heat drying oven (grasslands)

LAND COVER MAPPING (manual mapping is Basic; computer-assisted mapping is Advanced)

Description: Students make land cover maps of their GLOBE Study Site using both manual and computer techniques and GLOBE-supplied Landsat imagery. Some sample sites studied using Qualitative and Quantitative Land Cover Assessment protocols are used to help in making these maps, while others are used to check the accuracy of the maps.

Instrument: clear plastic sheets, felt-tip markers, Modified UNESCO Classification System (MUC) Field Guide and Glossary of Terms

PHENOLOGY

SUMMARY: Students measure the pace of emergence of new leaves and their senescence for native deciduous trees, shrubs, or grasses.

GREEN-UP (Basic)

Description: Students measure the emergence of new leaves from four buds on a single branch of a tree or shrub or of four new shoots of grass.

Instruments: Ruler, camera, flagging tape or marking stakes

GREEN-DOWN (Basic)

Description: Students measure the color change of four leaves on a single branch of a tree or shrub or of four shoots of grass.

Instruments: GLOBE Plant Color Guide, camera, flagging tape of marking stakes

Explanation of Descriptive Elements:

Teacher training: Where GLOBE teachers are trained in the protocols in a workshop or other forum. This training is person-to-person and involves hands-on conduct of the protocol by the trainee. Training is delivered by GLOBE-trained trainers except in the cases where a local expert is used or an alternative trainer has been approved by GLOBE.

Trainer training: Where GLOBE will train trainers, both domestic and international, in the protocol.

School implementation: Where schools are expected to implement the measurement protocol and collect and report the data, provided the protocol is grade-appropriate for the school.

Inclusion in Teacher's Guide: Whether the protocol and associated material, including an introduction to the Principal Investigator (PI) and team, science background information, learning activities, instrument specifications, and data entry forms and sheets are included in the print and Web versions of the Teacher's Guide or in Supplements to the Guide.

Protocol video: Whether GLOBE will produce and distribute a protocol video aimed at teachers with students as a secondary audience. The video complements the Teacher's Guide and provides an illustration of how the protocol is conducted and of key pointers on how to do so correctly.

Written & Internet distribution to schools: Whether GLOBE will make the written and graphic material available to schools in writing and as part of the GLOBE Web server.

Systems support: Whether GLOBE will provide for the entry of data, the visualization of these data, the archival of data as part of the GLOBE Student Data Archive, and the distribution of these data to all who request them.

PI funding at US institutions: Whether there is GLOBE Program support for the PI team. If the Principal Investigator and research team, including an educator Co-Principal Investigator (Co-PI), are at US institution(s), they may receive funding from GLOBE for the conduct of research using the data gathered following the protocol, development and maintenance of the protocol-related materials, review of all data submitted for the protocol for accuracy and adequacy for use in research, interaction with students and teachers including support for training, and the provision of supporting educational materials. If the PI and team are at a non-US institution, they may receive this support from a national source in their country or from a multilateral funding entity.

7.2 GLOBE Measurements and Instruments

GLOBE environmental measurements are in four study areas: Atmosphere/Climate, Hydrology, Land Cover, and Soils. The following pages summarize the currently specifications for the instruments. The GLOBE measurements and instruments are differentiated by skill level.

This information can also be found on the GLOBE Website <www.globe.gov> by clicking on "GLOBE Instruments" link located under the "Scientists' Corner" link on the task bar to the left of your computer screen. You may also go directly to it using the following website:

http://www.globe.gov/sda-bin/wt?ghp/tg+L(en)+P(toolkit/Measurements)

Measurement	Instrument	Skill Level
Atmosphere/Climate		
Cloud Cover/Type	Cloud chart	All
Precipitation, Liquid	Rain gauge	All
Precipitation, Solid	Snow board, Rain gauge, Snow depth pole	All
Precipitation pH	pH indicator paper	Beginning
	pH pen, one pH buffer	Intermediate
	pH meter, three pH buffers	Advanced
Air Temperature Maximum/Minimum & Current	Maximum/Minimum thermometer, Calibration thermometer, Instrument shelter	All
Hydrology		
Transparency -- Deep Water Sites Only	Secchi Disk, 5 m rope	All
Transparency -- Surface Water	Turbidity tube	All
Water Temperature	Organic liquid-filled thermometer	All
Dissolved Oxygen	Dissolved oxygen kit	Intermediate, Advanced
Water pH	pH indicator paper	Beginning
	pH pen, one pH buffer	Intermediate
	pH meter, three pH buffers	Advanced
Electrical Conductivity -- Fresh Water Sites Only	Total dissolved solids (conductivity) tester, calibration solution	All
Salinity - Brackish and Salt Water Sites	Hydrometer, 500 mL clear plastic graduated cylinder, organic liquid-filled thermometer	All
Salinity Titration Method- Brackish and Salt Water Sites	Salinity kit	Optional Intermediate, Advanced
Alkalinity	Water alkalinity kit	Intermediate,

		Advanced
Nitrate	Water Nitrate kit	Intermediate, Advanced
Soil		
Soil Characterization - Field Slope, Horizon Depth, Structure, Color, Consistence, Texture, Carbonates	Clinometer, Camera, Meter stick, Color chart, Sample cans, Other containers, Shovel or Auger	All
Soil Characterization - Lab Bulk Density, Particle Size, Soil pH, Fertility	Drying oven, 100 mL Graduated cylinder, 500 mL clear plastic graduated cylinder, Hydrometer, Thermometer, Dispersing solution, pH paper, pen or meter and pH buffers, Soil NPK kit	All
Soil Moisture	Balance, Meter stick, Drying oven (soils), Sample Cans Other soil containers, Auger (depth sampling), 50 m tape measure (transect)	All
Gypsum Block Soil Moisture	Soil moisture meter, Gypsum blocks, PVC piping	Optional, Advanced
Infiltration	Dual ring infiltrometer	All
Soil Temperature	Soil thermometer	All
Land Cover/Biology		
Land Cover Mapping	Remote sensing image, MultiSpec software	All
Species Identification	Dichotomous keys	All
Biometry Tree Circumference Tree Height Canopy Cover Ground Cover	Clinometer and densiometer (both may be student-made), 50m tape measure	All
Biometry Grass Biomass	drying oven (plants)	All
Location		
Latitude and Longitude of study sites	Global Positioning System receiver	All

7.3 Scientific Instruments for GLOBE Measurements

A number of instruments, supplies, and pieces of equipment are needed to conduct the GLOBE measurements properly. Many of these can be purchased from suppliers while some can be made by students or individuals in the school community. The GLOBE measurements and instruments are differentiated by skill level. In the KIT Column of the following table, B, I, and A indicate that an instrument is included in a beginning (B), intermediate (I), or advanced (A) level kit. Each kit includes the minimum set of instruments which most schools will need to purchase in order to do the GLOBE protocols appropriate for their educational level. O indicates that purchase of this instrument is optional and that it is not included in a kit either because most schools should already have access to one, because schools in an area can reasonably share one instrument, or because the instrument is needed only if certain options within the GLOBE protocols are chosen. M indicates that the instrument can be made at the school or with local assistance.

Instrument	Kit (B,I,A,O,M)	Measurement	Skill Level
Cloud Chart	O[1]	Cloud Cover/Type	All
Maximum/Min. Thermometer	B,I,A	Air Temperature - Max/Min. & Current Temperature	All
Calibration Thermometer	B,I,A	Air Temperature	All
(Organic liquid-filled thermometer)		Water Temperature, Salinity, Soil Particle Size	
Instrument Shelter	B,I,A,M	Air Temperature	All
Rain gauge	B,I,A	Precipitation, Liquid, Solid	All
Snow board	M	Precipitation, Solid	All
Snow depth pole	O,M	Precipitation, Solid	All
pH indicator paper	B	Precip. pH, Water pH, Soil pH	Begin.
pH pen	I	Precip. pH, Water pH, Soil pH	Int.
pH 7 buffer	I,A,M	Precip. pH, Water pH, Soil pH	Int., Adv.
pH meter	A	Precip. pH, Water pH, Soil pH	Adv.
pH 4 and pH 10 buffers	A,M	Precip. pH, Water pH, Soil pH	Adv.
Dissolved oxygen kit	I,A	Dissolved Oxygen	Int., Adv.
Water alkalinity kit	I,A	Alkalinity	Int., Adv.
Safety Equipment - Plastic gloves and goggles	I,A	Hydrology: Dissolved Oxygen, Alkalinity, Salinity, Titration Nitrate	Int., Adv.
Total dissolved solids (conductivity) tester	B,I,A[2]	Electrical Conductivity - Fresh water sites only	All
Calibration solution	B,I,A,M[2]	Electrical Conductivity - Fresh water sites only	All
Hydrometer	B,I,A	Soil: Particle Size, Salinity - Brackish/salt water only	All
500 mL clear plastic	B,I,A	Soil: Particle Size, Salinity -	All

graduated cylinder		Brackish/salt water only	
Salinity kit	O	Salinity -- Titration Method	Optional, Int., Adv.
Water Nitrate kit	I,A	Hydrology: Nitrate	Int., Adv.
Secchi Disk, Rope	O,M	Transparency -- Deep water site only	All
Turbidity tube	M	Transparency Shallow water site	All
Remote sensing image data	See footnote[3]	Land Cover Mapping	All
MultiSpec software	See footnote[4]	Land Cover Mapping	All
Dichotomous keys	O[5]	Species Identification	All
50 m tape measure	B,I,A	Site Layout, Tree Circumference, Tree Height	All
Clinometer	O,M	Tree Height, Slope	All
Densiometer	M	Canopy Cover	All
Plant clippings drying oven	O	Grass Biomass	All
Dutch auger[6]	O	Soil: Profile, Bulk Density, Soil Moisture	All
Sand auger[6]	O	Soil: Profile, Bulk Density, Soil Moisture	All
Peat auger[6]	O	Soil: Profile, Bulk Density, Soil Moisture	All
Bucket auger[6]	O	Soil: Profile, Bulk Density, Soil Moisture	All
Shovel	O	Soil: Profile, Bulk Density, Soil Moisture	All
Camera	O	Soil Profile, Land: Site Layout	All
Meter stick	O	Soil: Depth, Soil Moisture	All
Color chart	B,I,A	Soil Color	All
Distilled white vinegar	O	Soil: Free Carbonates	All
Acid squirt bottle	B,I,A	Soil: Free Carbonates	All
#10 sieve (2 mm mesh)	B,I,A	Soil: Bulk Density, Particle Size	All
Soil drying oven	O	Soil: Moisture, Bulk Density	All
Balance	O	Gravimetric Soil Moisture, Soil Bulk Density	All
Soil cans - 15	O,M	Gravimetric Soil Moisture Soil Bulk Density -- Pit or surface method	All
Other soil containers	O	Gravimetric Soil Moisture Soil Bulk Density	All
Dispersing solution	B,I,A,M	Soil: Particle Size	All
100 mL graduated cylinder	B,I,A	Soil pH, Bulk Density	All
Soil NPK kit	I,A	Soil Fertility	Int., Adv.

Garden Trowel	O	Gravimetric Soil Moisture	All
PVC Pipe	O,M	Gypsum Block Soil Moisture	Optional Adv.
Gypsum Blocks (4 required)	O	Gypsum Block Soil Moisture	Optional Adv.
Soil Moisture Meter	O	Gypsum Block Soil Moisture	Optional Adv.
Dual Ring Infiltrometer	O,M	Soil: Infiltration	All
Soil Thermometer	B,I,A	Soil: Temperature	All
Global Positioning System receiver	O[7]	Latitude, longitude and elevation	All

[1] One copy provided to each GLOBE teacher at training
[2] Include in kit only for freshwater sites
[3] Remote sensing image data provided by GLOBE or Country Coordinator
[4] Downloadable from Purdue University
http://dynamo.ecn.purdue.edu/~biehl/MultiSpec/Index.html
[5] Choose a dichotomous key appropriate to local vegetation; a generally applicable dichotomous key will be provided to each teacher at training
[6] Select auger appropriate for local soil type
[7] Available from the GLOBE OFFICE for a temporary loan to GLOBE Country Coordinators

7.4 GLOBE Instrument Specifications

Atmosphere/Climate

Cloud Cover/Type - All Skill Levels
Instrument Specifications: Cloud Chart

The GLOBE cloud chart shall display at least one visual example of each of the 10 basic cloud types -- cirrus, cirrostratus, cirrocumulus, altostratus, altocumulus, cumulus, nimbostratus, stratus, cumulonimbus, and stratocumulus**.** Sky cover will be visually estimated. The GLOBE Program will provide a cloud chart to each trained U.S. teacher and to each GLOBE Program Country Coordinator.

Precipitation, Liquid - All Skill Levels
Instrument Specifications: Rain gauge

Precipitation will be measured with a clear view plastic rain gauge with a collector that is at least 102 mm in diameter. The rain gauge must be at least 280 mm in height with a scale indicating rain collected of 0.2 mm or less on an inner clear cylinder. It must have the capacity to measure rainfall of 280 mm without overflowing. The shape of the outer part must also be cylindrical, and overflow from the inner cylinder shall be directed to the outer part of the rain gauge. The outer cylinder must be capable of being used in the inverted position to gather a snow sample for measurement of the water content of snow. The rain gauge must be provided with the necessary hardware for installation on a pole. Instructions for siting are provided in the GLOBE Program Teacher's Guide.

Precipitation, Solid - All Skill Levels
Instrument Specifications: Snow Board

The depth of daily snowfall will be measured with a plywood board which is approximately 40 cm X 40 cm x at least 1 cm thick.

Instrument Specifications: Rain Gauge

The rain gauge described in Precipitation, Liquid will be used for this measurement.

Instrument Specifications: Snow Depth Pole

For snow depths less than 1 meter, a meter stick is recommended. When the snow is deeper than one meter, a snow depth pole is used. This can be made from a 2 meter pole by placing two meter sticks end to end on this pole.

Precipitation pH - All Skill Levels

The same instruments described in Hydrology: Water pH will be used for this measurement.

Air Temperature - All Skill Levels

Instrument Specifications: Maximum/Min. Thermometer

Air temperature shall be measured with a maximum/minimum thermometer. The maximum/minimum thermometer shall be readable only in degrees Celsius, with maximum and minimum scales marked in increments of 1.0° C, and the scales must be capable of supporting temperature estimations to the nearest 0.5° C. The thermometer must be in a sturdy protective case, and be provided with the necessary hardware for installation. It must be factory calibrated to an accuracy of +1.0° C. Both scales must be adjustable for calibration. Each scale must be clearly marked to indicate Celsius, and have indicators such as "+" and "-" on each scale to indicate direction of increasing and decreasing temperature. In addition, each scale must be clearly marked to identify which scale is maximum and which is minimum. Siting and installation instructions are provided in the GLOBE Program *Teacher's Guide.*

Instrument Specifications: Calibration Thermometer

The maximum/minimum thermometer will be calibrated with a second thermometer which is an organic liquid-filled thermometer with a temperature range of -5° C to 50° C. The thermometer must be factory calibrated and tested with standards traceable to N.I.S.T (The National Institute of Standards and Technology - United States) to an accuracy of +0.5° C, with 0.5° C scale divisions. It must be supplied with a metal jacket with holes at the bulb end to allow for circulation and a hole at the top by which to hang the thermometer in the instrument shelter for calibration of the maximum/minimum thermometer.

Instrument Specifications: Instrument Shelter

An instrument shelter is required to house the maximum/minimum thermometer and the calibration thermometer to assure scientifically usable air temperature measurements. The instrument shelter must be constructed of a material with a thermal insulation value which equals or exceeds that of seasoned white pine wood (1.8 cm thick). It must be painted white with exterior grade paint. The shelter must be vented, and be large enough to allow air circulation around the thermometer. The inside dimensions must be at least 45 cm high, 22.8 cm wide, and 15.25 cm deep. The shelter must have a hinged door on the front, be louvered on the front and sides, and have holes in the bottom and holes at the uppermost part of the sides to increase ventilation if the louvers do not extend to the top of the sides. The door must contain a lock. The instrument shelter must be mountable onto a wall or post. The top of the shelter must slope downward toward the front. The parts of the shelter must be securely fastened to each other, either using screws or with nails and glue. Joints must be sealed with weather resistant caulking compound.

Hydrology

Water Temperature: - All Skill Levels

Instrument Specifications: Organic liquid-filled thermometer

The calibration thermometer described in Air Temperature will be used for this measurement.

Transparency - All Skill Levels

Instrument Specifications: Secchi Disk Apparatus (for deep water sites only)

5 m length of rope and a disk with a diameter of 20 cm. The disk shall be colored with paint or other appropriate means such that alternate quadrants of each side are black and white. The disk must be made so that it will not be disfigured or damaged by repeated immersion in water, including sea water. It must be weighted such that it remains horizontal while it is lowered by the rope in the water.

Instrument Specifications: Turbidity Tube (for surface water)

Clear plastic tube, approximately 1.2 m long and 4.5 cm diameter with a white cap that fits securely on the end of the tube. The end cap must display a pattern consisting of alternating black and white quadrants on the side that is viewed by looking down the tube.

Water pH - All Skill Levels

Note: The instrument requirements for this measurement vary according to skill level. Please select the appropriate instrument for your students.

Skill Level - Beginning

Instrument Specifications: pH Paper

The pH of standing water at this skill level will be measured with pH paper which can be purchased in strips or rolls. The pH paper must have +1.0 pH unit accuracy, with a range pH 1 to pH 14.

Skill Level - Intermediate

Instrument Specifications: pH Pen

The pH of standing water at this skill level will be measured with a pH pen. The GLOBE instrument must have an accuracy of +0.2 pH units with a range of pH 1 to pH 14. The operating temperature range must be 0° C to 50° C. The pH pen must be capable of being calibrated using a known pH buffer solution.

Skill Level - Advanced

Instrument Specifications: pH Meter

The pH of standing water at this skill level will be measured with a pH meter. The pH meter must have an accuracy of +0.1 pH unit, and a range of pH 1 to pH 14, at temperatures from 0° C to 50° C. The device shall automatically compensate the reading when it is placed in solutions of differing temperature. The pH meter must be capable of being calibrated automatically using known pH buffer solutions.

Skill Level - Intermediate, Advanced
Instrument Specifications: Buffers

pH buffer solutions are required to calibrate the pH pen and meter. The buffer solutions should have a value of pH 4.0, pH 7.0 and pH 10.0; only the pH 7.0 buffer is required for the pH pen at the intermediate skill level.

Dissolved Oxygen - Intermediate, Advanced Skill Levels
Instrument Specifications: Dissolved Oxygen Kit

A dissolved oxygen test kit can be purchased. Teachers or manufacturers who wish to use or prepare another version should ensure that it also meets the following requirements:

- Enables measurement of dissolved oxygen with an accuracy of at least +/- 1 mg/L
- Contains all the chemicals and special containers to perform this measurement based on the Winkler titration method. This method is described in *Standard Methods for the Examination of Water and Wastewater*, 19th edition, 1995, a publication of the American Public Health Association, Washington, DC.
- Contains clear instructions for using the kit to make this measurement using a procedure based on the Winkler titration method.

Alkalinity - Intermediate, Advanced Skill Levels
Instrument Specifications: Water Alkalinity Kit

A water alkalinity kit can be purchased. Teachers or manufacturers who wish to use or prepare another version should ensure that it also meets the following requirements:

- Enables measurement of total alkalinity with an accuracy of at least 6.8 mg/L as $CaCO_3$ (low range, under 136 mg/L), and 17 mg/L as $CaCO_3$ (high range, above 136 mg/L).
- Contains all chemicals and containers needed to perform the alkalinity titration, including: 1) Bromocresol green-methyl red indicator and scoop for adding the required amount to the sample, 2) sulfuric acid for titration, and method of delivering acid to sample to achieve the required accuracy, 3) measuring containers and bottles for titration. This method is described in 19th edition, 1995, a publication of the American Public Health Association, Washington, D.C.
- Contains clear instructions for using the kit to make this measurement, based on acid titration to a Bromocresol green-methyl red end point.
- Plastic gloves and safety goggles

Instrument Specifications: Safety Equipment

Plastic gloves and safety goggles must be used in making this measurement.

Electrical Conductivity (for fresh water sites) - All Skill Levels

Instrument Specifications: Electrode-type total dissolved solids tester (conductivity meter)

This device shall measure electrical conductivity of liquid solutions using two metal electrodes separated by a fixed distance. The device shall be designed to be hand-held, and battery powered, with no electrical power cord attached. The device shall employ a method to automatically compensate the indicated conductivity value relative to changes in the temperature of the solution. The measurement range shall be at least from 0-1990 microSiemens/cm, with a resolution of 10 microSiemens/cm, an accuracy of +/- 2% full scale, and an operating temperature of 0-50 C. The device shall be capable of calibration using a standard solution.

Instrument Specifications: Calibration Standard

A solution of KCl and water or NaCl and water that has a conductivity of about 450 microSiemens (225.6 mg/L KCl or 215.5 mg/L NaCl).

Salinity (for brackish and salt water sites) -All Skill Levels

Instrument Specifications: Hydrometer Method

The same instrument described in Soil Particle Size will be used for this measurement.

A 500 mL clear plastic cylinder and an organic liquid-filled thermometer for use with the hydrometer are required. The 500 mL cylinder for Soil Particle Size may be used. The calibration thermometer for Air Temperature may be used.

Instrument Specifications: Salinity Titration Method - Optional, Intermediate, Advanced Skill Levels

A salinity kit can be purchased. Teachers or manufacturers who wish to use or prepare another version should ensure that it also meets the following requirements:

- Range: 0 - 20 parts per thousand (ppt)*
- Smallest increment: 0.4 ppt
- Method/chemistry: chloride titration
- Approximate number of tests: 50
- Contains clear instructions for using this kit to make this measurement, based on the chloride titration method.

*Titrator must be refillable for use in higher salinity waters.

Nitrate - Intermediate, Advanced Skill Levels

Instrument Specifications: Water Nitrate Kit

A nitrate kit can be purchased. Teachers or manufacturers who wish to use or prepare another version should ensure that it also meets the following requirements:

- Range: 0 - 10 ppm NO_3-N
- Smallest increment: 0.05 ppm NO_3-N for the range 0 -1 ppm NO_3-N; 0.5 ppm NO_3-N for the range 1 - 10 ppm NO_3-N
- Method/chemistry: cadmium reduction
- Approximate number of tests: 50
- Contains clear instructions for using this kit to make this measurement, based on the cadmium reduction method.

Soil Characterization

Soil Slope - All Skill Levels
Instrument Specifications: Clinometer

The clinometer described in Land Cover: Tree Height will be used for this measurement.

Soil Profile - All Skill Levels
Instrument Specifications: Camera

It is assumed that a camera with color film is available locally.

Instrument Specifications: Meter Stick

A durable ruler with gradations every cm and mm.

Soil Structure - All Skill Levels
Instrument Specifications: None

Color - All Skill Levels
Instrument Specifications: Color Chart

A soil color chart designed especially for the GLOBE Program can be purchased. It contains at least 200 colors and uses the Munsell System of Color Notation. This flip chart is weather-resistant and has large color chips which are edge-mounted for ease of reading. The color range includes all hues found in the full set of International soil colors, yet provides a selected set of values and chroma to aid color identification for students. Manufacturers who wish to prepare another version should contact the GLOBE Program for the complete list of colors.

Soil Consistence - All Skill Levels
Instrument Specifications: None

Soil Texture- All Skill Levels
Instrument Specifications: None

Free Carbonates - All Skill Levels
Instrument Specifications: Vinegar

Distilled white vinegar. Household vinegar may be used.

Instrument Specifications: Acid Squirt Bottle

A bottle capable of safely holding at least 200 mL of acid is required.

Sample Preparation for Bulk Density, Particle Size, Soil pH, and Fertility Protocols - All Skill Levels

Instrument Specifications: Sieve

Number 10 sieve with 2 mm mesh attached to a frame.

Soil Bulk Density - All Skill Levels

Instrument Specifications: Graduated Cylinder -100 mL

Glass graduated cylinder with a capacity of 100 mL marked in 1 mL or smaller divisions, with graduations covering at least the range from 10 mL to 100 mL.

Instrument Specifications: Balance and Augers

The same balance and auger used for Gravimetric Soil Moisture will be used for Bulk Density.

Instrument Specifications: Soil Sample Cans and Other Soil Containers

Cans and containers should meet the same specifications as given for these items for Gravimetric Soil Moisture

Soil Particle Size - All Skill Levels

Instrument Specifications: Hydrometer

The hydrometer used should meet the following requirements:

- Calibrated to specific temperature for water and sample (e.g. 15.6 C / 15.6 C)
- Range (specific gravity / no units): 1.0000 - 1.0700
- Smallest increment (no units): 0.0005

Instrument Specifications: Thermometer

The Calibration Thermometer described in Air Temperature will be used for this measurement.

Instrument Specifications: 500 mL Clear Plastic Graduated Cylinder

One 500 mL capacity plastic graduated cylinder, marked at least at the 500 mL level. Cylinder must be clear plastic, not frosted plastic and not glass.

Instrument Specifications: Dispersing Solution

Sodiumhexametaphosphate powder or a 10% solution of either sodiumhexametaphosphate or a detergent that does not produce suds.

Soil pH - All Skill Levels

Instrument Specifications: pH measurement devices

The same instruments described in Hydrology: Water pH will be used for this measurement.

Instrument Specifications: Graduated Cylinder -100 mL

The same instrument as described in Bulk Density will be used for this measurement.

Soil Fertility - Intermediate, Advanced Skill Levels

Instrument Specifications: Soil NPK (Macronutrients) Kit

The test kit must:

- Contain unit-dose reagents and containers needed to extract soil nutrients from 50 samples and to perform 50 tests of each: soil nitrogen; soil phosphorus; and soil potassium.
- Employ methods based on the Spurway extraction method, the zinc reduction/chromotropic acid method for nitrogen, the ascorbic acid reduction method for phosphorus, and the sodium tetraphenylboron (turbidimetric) method for potassium.
- Contain clear instructions, including diagrams, for using the kit.
- Contain a water resistant color chart for interpreting the results of colorimetric tests and a turbidity chart for the turbidimetric test.

Soil Moisture and Temperature

Gravimetric Soil Moisture - All Skill Levels

Instrument Specifications: Balance

This balance must have the capacity to weigh 300 grams with an accuracy of +/- 0.1 gram. It can be either mechanical or electronic. It is assumed that a balance is available locally, for example in a high school science laboratory.

Instrument Specifications: Drying Oven (soils) (soils)

Drying oven capable of holding a temperature of 95 C - 105 C for at least 10 hours or a temperature of 75 C - 95 C for 24 hours. The oven must be ventilated, and have interior dimension of at least 25 cm x 30 cm x 25 cm. It is assumed that an oven is available locally, for example in a high school science laboratory.

Instrument Specifications: Microwave Drying Oven

Any microwave oven compatible with school use.

Instrument Specifications: Soil Sample Cans

15 round sample tins. A metal container with a diameter 7 cm, and height 5 cm, with a removable cover is appropriate as are small round, cleaned food cans. Cans must be capable of having a small hole punched in their bottoms.

Instrument Specifications: Other Soil Containers

15 containers large enough to have soil samples transferred into them directly from an auger without loss of sample. Glass jars, plastic food containers with lids, or other containers that can be covered and that can hold the soil samples while they are dried in the drying oven selected.

Instrument Specifications: Dutch Auger For Combination Soils

Dutch (or Edelman) auger for combination soils with a head having the minimum dimensions of 7 cm wide and 18 cm long. The unit (head and shaft inclusive) should be at least 120 cm long in order to be suitable to dig a hole up to 1m deep. It should be of one piece welded construction.

Instrument Specifications: Dutch Auger For Sandy Soils

Auger designed for sandy soils with a head having the minimum dimensions of 7 cm wide and 18 cm long. The unit (head and shaft inclusive) should be at least 120 cm long in order to be suitable to dig a hole up to 1m deep. It should be of one piece welded construction.

Instrument Specifications: Bucket Auger

Bucket (or Riverside) auger designed for hard and brittle soils with a head having the minimum dimensions of 7 cm wide and 18 cm long. The unit (head and shaft inclusive) should be at least 120 cm long in order to be suitable to dig a hole up to 1m deep. It should be of one piece welded construction.

Instrument Specifications: Peat Auger

Auger designed for peat soils with a head having the minimum dimensions of 7 cm wide and 18 cm long. The unit (head and shaft inclusive) should be at least 120 cm long in order to be suitable to dig a hole up to 1m deep. It should be of one piece welded construction.

<u>Gypsum Block Soil Moisture - Optional, Advanced Skill Level</u>
Instrument Specifications: Gypsum Blocks

Cast gypsum blocks: approx. 25 mm high x 20 mm diameter; in which concentric stainless steel mesh electrodes are embedded; 1.5-2.0 meter insulated lead wire soldered to electrodes

Instrument Specifications: Soil Moisture Meter

Hand-held AC conductivity meter designed for use with gypsum blocks (described above); push button calibration/compensation and push button digital reading. Conductivity may be normalized to between 0 and 100. The unit must have two terminals which enable attachment

and removal of electrical conductor wires on a daily basis. The unit must be battery powered and be capable of being hand-held and used in remote locations.

Instrument Specifications: PVC Piping

The PVC pipe assists in placing the gypsum block sensors in the ground. It should be 90 cm in length and approximately 2 cm in diameter. Additional PVC piping is required to mark the location of the sensors. These should be 23 cm long with a diameter of approximately 5 cm. Four pieces of this material are required.

Infiltration All Skill Levels
Instrument Specifications: Dual Ring Infiltrometer

Two concentric metal cylinders. The inner one must have a diameter of 10 cm to 25 cm. The outer one must have a diameter at least 10 cm larger than the inner cylinder. Both cylinders should be 10 to 15 cm high and open at both ends. Steel cans may be found which will work for this apparatus.

Soil Temperature- All Skill Levels
Instrument Specifications: Soil thermometer

An 11 cm to 20 cm stainless steel probe, heavy-duty construction dial or digital thermometer with a range of at least -10 to 50 degrees C (Celsius scale required) and an accuracy of 1% full scale (over a range of no more than 200 degrees C) or better is required. The sensor should be in the bottom third of the probe. The sensor should give stable readings after less than 60 seconds in an isothermal bath. Batteries, if required, should be included. The sensor should be adjustable with the calibration procedure and achievable accuracy clearly stated. Dial thermometers must be sealed against fogging and be covered with shatterproof glass or plastic. Scale graduations of 1.0 degrees C and 0.1 degrees C are preferred for dial and digital thermometers, respectively. Glass stem thermometers are NOT acceptable.

Land Cover/Biology

Land Cover - All Skill Levels
Instrument Specifications: Landsat Thematic Mapper (TM) Image, MultiSpec software.

The GLOBE Program will provide a TM image to all US schools. MultiSpec software is available for downloading from the Internet.

Species Identification - All Skill Levels
Instrument Specifications: Dichotomous Keys

Dichotomous keys for tree identification are not available from a central supplier; they need to be acquired locally.

Biometry Layout of the Biology Site - All Skill Levels
Instrument Specifications: Tape Measure

50 m tape, graduated one side, marked in 2 mm or smaller units.

Tree Circumference - All Skill Levels
Instrument Specifications: Tape Measure

The tape measure described in Layout of the Biology Site will be used for this measurement.

Tree Height - All Skill Levels
Instrument Specifications: Tape measure

The tape measure described in Layout of the Biology Site will be used for this measurement.

Instrument Specifications: Clinometer

The clinometer may be made by students from plans in the GLOBE Teacher's Guide, or may consist of a moveable dial within a metal case and lens viewer. For the moveable dial version, the scale must be graduated from 0-90 in 1° units.

Canopy Cover - All Skill Levels
Instrument Specifications: Densiometer

The densiometer may be made by students according to instructions in the GLOBE Teacher's Guide.

Ground Cover - All Skill Levels
Instrument Specifications: none

Grass Biomass - All Skill Levels
Instrument Specifications: Balance

This balance must have the capacity to weigh 300 grams with an accuracy of +/- 0.1 gram. It can be either mechanical or electronic. It is assumed that a balance is available locally, for example in a high school science laboratory.

Instrument Specifications: Drying Oven (plants)

This oven must be capable of holding samples at 50-70 C for up to two days and must be ventilated to allow moisture to escape. The interior dimensions of the oven must be at least 25 cm x 30 cm x 25 cm. It is assumed that an oven is available locally, for example in a high school science laboratory. The oven should be designed for drying biological samples or food and should not be a conventional cooking oven, which could present a fire hazard in this application.

GPS

Latitude, Longitude and Elevation of GLOBE Study Sites - All Skill Levels
Instrument Specifications: Global Positioning System (GPS) Receiver

The instrument must be capable of:

- Expressing latitude and longitude in whole degrees, minutes and decimal minutes to the nearest 0.01 minutes and

- Displaying time on screen in units of UT hours, minutes, and seconds,
- Using the WGS-84 map datum, and
- Displaying elevation in meters.

7.5 Scientific Instrument Vendors

The GLOBE Office provides the instrument specifications to each of our Partners and it is up to each Country Coordinator to find instruments that meet specifications.

The GLOBE Office has sent the GLOBE Instrument Specifications to potential instrument suppliers. A number of suppliers have provided information sheets with catalog/ordering numbers and prices of items which they offer, and which the suppliers state meet GLOBE specifications. This information is available on the GLOBE website in the "Resource Room" under the "Scientific Instrument and Equipment Suppliers" link.

http://archive.globe.gov/sda-bin/wt/gh/GRR+L(en)+Dg(gmx/el)Gn(Scientific~20Instrument~20and~20Equipment~20Suppliers)

The GLOBE Program does not endorse any of these suppliers, but hopes that this information will assist GLOBE schools in the purchase of instruments needed to participate in the GLOBE Program. Prices and other information from the suppliers may change, so it is important to contact any supplier for the latest information prior to ordering instruments.

Shipping costs also vary by destination.

7.6 Science Objectives and Use of GLOBE Data

GLOBE science investigators have plans to use every type of data collected by GLOBE. Brief statements of these uses are given below. In addition, environmental data almost always have additional uses beyond the ones planned. Some of these uses arise long after the data are collected. Therefore, taking Earth science data has both current and future value. Taking today's Earth science data is something no one can come back and do tomorrow. In Earth science, the first imperative is to collect today's data.

	GLOBE data:
Clouds	• Help tie new measurements of clouds by automated sensors to long-term historical data records of human observations • Help to identify cloud type more accurately than is possible by remote sensing • Contribute to determination of how cloud climatology may be changing (a major issue in assessing climate change) • Contribute to improved interpretation of satellite observations of Earth's radiative balance
Air Temperature, Precipitation, and Relative Humidity	• Provide a denser network of observations than is available using only official weather stations • Provide finer resolution data crucial for investigating localized variations (e.g., urban heat islands, microclimates) • Augment data needed for regional forecasts and climate records in areas of the world where there are few official weather stations
Atmosphere	
Combined Atmosphere, Surface, & Soil Temperature	• Help scientists calculate the rate of heat exchange between the atmosphere and the soil (see also entries for Atmosphere Temperature & Soil Temperature)
Aerosol	• Provide calibrated ground-based observations to help assess the performance of space-based instruments and to fill in the global views of aerosol distributions provided by satellite remote sensing • Detect the presence of dust, smoke, and other aerosols and help scientists track their movement around the world
Ozone	• Identify areas of high and low ozone concentrations and the times of year and weather conditions when they occur • Help scientists interpret satellite observations of the total column density of ozone • Provide quantitative measurements of ozone to help local agencies and others know how much ozone is present to affect plants and animals

Hydrology	Improve the monitoring of surface waters both inland and along the coasts of oceans and seas
Transparency	• Determine how far light can penetrate the water and support the growth of algae and submerged aquatic vegetation
Temperature	• Determine the overturning of lakes • Track the mixing of waters in estuaries and along coasts • Help determine evaporation rates • Help scientists determine what can live in the water
pH	• Help scientists determine what can live in the water, both animals and plants • Track the mixing of waters in estuaries and along coasts • Help scientists relate water quality to surrounding soil and geology and to the pH of rain and snow melt
Conductivity	• Determine the overall loading of salts and other compounds dissolved in fresh water • Help determine the usability of fresh water for different purposes
Salinity	• Track the mixing and source of waters in estuaries and along coasts • Help track the state of saline inland waters
Alkalinity	• Help determine the vulnerability of fresh waters to changes in pH from inputs of acidity
Dissolved Oxygen	• Determine what animals can live in the water • Help scientists determine the mixing of air and water at the water's surface
Nitrates	• Help scientists determine the potential uses of water • Help determine the effects of inputs of nutrients on a water body
Fresh Water Macroinvertebrates	• Help determine the biodiversity of a fresh water ecosystem • Help scientists determine the overall state of a water body
Marine Macroinvertebrates	• Help determine the biodiversity of coastal beach ecosystems • Help determine the overall state of coastal beach ecosystems • Test the hypothesis that the distributions of marine animals will change with climate change

Soil	
Temperature	• Provide new data for tracking climate and annual cycles • Help scientists determine times of pest emergence and plant sprouting • Help determine heat transport in near-surface soil • Help scientists monitor the energy balance of the Earth system
Moisture	• Help track the water cycle in the Earth system • Help determine the times of plant sprouting and growth • Help scientists improve weather and climate prediction • Compare with existing models and data sets for validation and for local detail
Field Characterization (structure, color, consistence, texture, and the presence of rocks, roots, & carbonates)	• Help scientists create soil maps • Help track the global carbon cycle • Provide information for interpretation of soil temperature and moisture measurements
pH	• Help determine what can grow in the soil • Help determine the effect on the pH of water flowing through the soil
Bulk Density	• Help in the interpretation of soil temperature and moisture measurements • Help determine soil porosity (volume of empty space for air and water) in combination with Particle Density
Particle Density	• Help determine soil porosity (volume of empty space for air and water) in combination with Bulk Density • Provide some indication of mineral versus organic content of soils • Help in the interpretation of soil temperature and moisture measurements
Fertility	• Indicate the suitability of the soil for supporting growth of crops and other plant life • Provide indication of nitrate and phosphate inputs to water bodies
Particle Size Distribution	• Determine the mixture of sand, silt, and clay particles in soil • Help determine the appropriate uses of a soil

Land Cover	Help scientists study the terrestrial components of the energy, water, carbon, nitrogen, and other cycles of the Earth system Help in the understanding of local climate and watersheds
Sample Site	• Classify land cover for comparison with maps derived from satellite remote sensing
Biometry	• Help scientists determine the amount of biomass present • Help validate land cover classifications of sample sites
Mapping	• Guide systematic observation of land cover classification
Change	• Determine land cover change in support of the study of changes in local climate, watersheds, and the cycles of the Earth system

Phenology	Help scientists detect the nature and extent of climate change and its effects on plants and animals
Green-up, Green-down Budburst, Lilacs, Phenology Gardens	• Delineate the length, start and end of the growing season • Help scientists interpret satellite observations of greenness
Hummingbirds	• Determine changes in hummingbird migration as both an indicator and response to climate changes

8. Coordinated GLOBE Science Investigators Selection Process

GLOBE welcomes proposals of peer-reviewed science investigations from institutions in GLOBE partner countries. The focus of these science investigations must be research that includes use of student data. There is no need that these investigations involve new measurements protocols because it would be good to have multiple research groups interested in each existing measurement.

Collaboration in the solicitation, funding, and management of GLOBE science investigations could be confined to a single country or could cover a group of GLOBE partner countries defined by the collaborating funder. GLOBE's only requirement is that GLOBE's NASA Program Manager concur in the selection of all GLOBE science investigations that have new measurements associated with them. This is necessary to keep the science of GLOBE coordinated, coherent, and consistent on a worldwide basis and because any new measurement protocols, educational materials, and training will be included by GLOBE in publications, trainings, symposia, and Website as appropriate.

The National Science Foundation (NSF) has just completed the selection of its third round of GLOBE science investigations. Roughly every three years, a new selection process will be held. However, the opportunity to collaborate on GLOBE science investigations is an ongoing process. Partners can choose to collaborate in upcoming NSF selection processes or choose to undertake their own solicitations GLOBE science investigations in collaboration with GLOBE. Funding and management of the investigations selected is done by the sponsoring partner in coordination with GLOBE.

The requirements for a partner to collaborate in this solicitation, funding, and management of GLOBE science investigations are:

1. Committing to funding the investigation(s) for a minimum of three years subject to the normal conditions of availability of funds;

2. Obtaining the concurrence of the GLOBE's NASA Program Manager in selection of all investigations that require a commitment of resources on GLOBE's part (concurrence is not required for investigations involving use of data from existing GLOBE protocols);

3. Funding and management of the selected investigations in some way (i.e., funding and management by host institution, international organization, nongovernmental organization, etc);

4. Supporting investigations only from institutions in GLOBE partner countries;

5. Including the use of some GLOBE student data in research intended for publication in the refereed research literature as a requirement for all selected investigations;

6. Provision of clear objectives and selection criteria for these investigations that are consistent with GLOBE and in which GLOBE concurs (GLOBE selection criteria are at Attachment B);

7. Requiring selected investigators to participate in some of the broader GLOBE activities which support the GLOBE partnership with teachers and students and to provide any protocol and educational materials required for the student measurements associated with the specific investigation (details in Attachment C); and

8. Requiring selected investigators to give papers at Annual GLOBE Conferences on the results of their research using GLOBE data.

A GLOBE Science Investigators Working Group will be established as a forum for GLOBE Scientists to make recommendations to a GLOBE International Science Management Team composed of representatives from the sponsoring partners.

A partner may choose to set standards that are higher than GLOBE standards. A partner would be under no obligation to select proposals if there are none which meet the partner's criteria for content and quality. The partner may make arrangements with GLOBE or others to handle funding and management of the investigations if it would prefer not to handle this internally. The partner is welcome to participate in future GLOBE/National Science Foundation (NSF) proposal reviews including selection of reviewers, provided that the confidentiality of the NSF process is not breached. A partner may conduct a separate review of proposals that are candidates for its funding, but the reviews of proposals that are candidates for selection must be shared with the GLOBE's NASA Program Manager in support of the concurrence process. The partner may offer a separate solicitation provided that GLOBE's NASA Program Manager concurs in those elements of it that may affect GLOBE.

Attachment A

Selection Criteria

All Proposals

The quality, importance, and overall intellectual merit of the proposed science

The degree of use and importance of GLOBE student data to the investigation

The likely availability of adequate student and other data to accomplish the research and publish within three years

The ability of the investigation team to achieve the research results proposed

The ability and commitment of the investigation team to contribute to the science and education mission of GLOBE by interacting with students and teachers, reviewing student data for quality, and reviewing GLOBE educational materials and science protocols and instrument specifications for on-going adequacy and excellence.

The broader impact of the proposal on: the breadth of participation in the research community; the promotion of teaching, training and learning; the enhancement of the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships; and society.

Proposals Involving New GLOBE Measurement Protocols

The appropriateness of the new measurement for implementation by students across GLOBE and the affordability of any instruments required

The extent and complexity of requirements on GLOBE systems, development of educational materials, and training activities

The ease with which existing trained GLOBE teachers could learn and successfully implement the protocol(s) based on written guidance and other materials so that the new measurement can be quickly introduced to on-going GLOBE measurement efforts

The commitment and capability of the proposed investigation team to develop the needed materials, including protocols, instrument specifications, background science contextual and introductory material, and complementary learning activities, in a timely fashion (i.e., within one year of the start of the investigation)

Attachment B

Required Investigation Components

All GLOBE science investigations must:

1. Perform research that relies at least in part on the use of GLOBE student data

2. Commit to publish research results in the peer reviewed literature or to demonstratively use GLOBE student data in a project or include GLOBE student data in a data set developed for broad research or applications use

3. Provide quality control and review of data from at least one GLOBE protocol

4. Provide on-going oversight of all issues surrounding at least one GLOBE protocol, including needs for any changes or improvements that may arise

5. Provide support to the overall implementation of GLOBE by contributing to the student-teacher-scientist partnership that is at the heart of GLOBE (i.e., conducting GLOBE Web Chats, responding to inquiries from GLOBE teachers and students, training protocols at workshops/conferences, participating in International GLOBE Teacher/Student Conferences, etc)

6. Work with GLOBE's NASA Program Manager on the scientific guidance and policies of GLOBE that pertain to or affect one or more GLOBE protocols

9. GLOBE Training and Support

Many of you have given the GLOBE Office feedback on ways that we could improve our Train The-Trainer Workshops to better meet your needs and to be more effective for participants. As a result of your feedback, we have spent the past few months working with many of the GLOBE Trainers, Partners, and office staff to define key issues that need attention and to devise solutions that work broadly. A key point to our new approach to training is to be more flexible in what we do and how we do it. For example, Partners may want training in only one or two topical areas for an individual trainer. That being said, there are some things that will remain inflexible, but they are few: GLOBE measurements must be taken following the protocols and using equipment that meets our specifications, and to join GLOBE, every school must have a GLOBE-trained teacher.

Here is a brief description of the evolved direction in which we are headed. We would appreciate any comments you might have on this approach so we can continue to improve support we give you.

In supporting its Partners, GLOBE sees training as part of a continuum that begins before and continues after a Partner sends participants to a Train-the-Trainer Workshop. Clearly, developing a qualified team of trainers is a major enabling step in the progress of virtually every Partner, but it is just one part of being a Partner.

The following description of our proposed training and support activities is broken down into three categories: "Initial Support," "Training," and "Continuing Support" to emphasize that the support the GLOBE Office provides starts immediately after a Partner joins GLOBE and continues indefinitely. Furthermore, it implies that the training process with Partners is often an on-going process that may take place over a number of training events, and the relationship between Partner Coordinators and GLOBE Trainers and Teachers in their Partnership is also an ongoing relationship much like the one between Coordinators and the GLOBE Office.

Below is a description of the goals we have for each of the identified areas. In some cases and locations, these goals are already being achieved while in others, they have yet to be realized. Please keep in mind that most of the suggestions came from the GLOBE Community, extending far beyond the GLOBE Office, and they have been offered based on a proven track record of success in one or more locations.

INITIAL SUPPORT GOALS:

Around the world, when new Partners join GLOBE, they will be welcomed immediately and personally by the senior management of GLOBE. Each Partner will then be introduced to the GLOBE staff officer who will be responsible for overseeing the support needed to develop the Partnership according to its own goals and the terms of the GLOBE agreement.

Initial support will include providing the new Partner with useful information regarding GLOBE, including background materials about the program as well as summaries and descriptions of

various roles and responsibilities. This information packet will include ideas and suggestions on developing an implementation strategy based on feedback we've received from other Partners. GLOBE staff officers will work closely with new Partners and, when possible, meet personally with them to assist in the determination, development, and achievement of their goals. It should be understood by Partners that one of the key goals of GLOBE is to have every GLOBE school report data.

New GLOBE Partners need a general understanding of GLOBE and what is involved before they send participants to a GLOBE Train-the-Trainer Workshop. The GLOBE staff will discuss with our Partners the expertise and abilities that are conducive to an individual being an effective GLOBE Trainer and the role Trainers play in Partnerships. They will work with Partners to put together the best team to send to a GLOBE Train-the-Trainer Workshop.

One objective of the above approach is to improve the efficiency and effectiveness of GLOBE Train-the-Trainer Workshops. With much of the background of GLOBE already provided to participants before the workshop, less time will be needed to discuss "background" and "overviews." In this way, the balance between sitting and listening and hands-on activity can be shifted to allow participants to experience GLOBE activities sooner.

TRAIN-THE-TRAINER WORKSHOPS:

Through the successful initial support efforts mentioned above, Partners will be expected to select and send the most appropriate persons to a Train-The-Trainer Workshop. Depending on the Partner, these individuals may come from a variety of different backgrounds. Improved success should result from having individuals more familiar with the goals, requirements and expectations of the GLOBE Program in advance. In this way, trainees can be expected to arrive at Train-the Trainer Workshops with a strong desire to be a part of GLOBE.

We have learned over the years that, with practice, persons with almost any background can understand the science of GLOBE, but it is the trainers and teachers who have a strong desire to participate in the program who are the most successful GLOBE participants. Also, training must engage the participants at their current levels of ability and experience and build from this base, so it is important for trainees to prepare for training as needed, and for GLOBE to be aware of the backgrounds of those attending each Train-The-Trainer Workshop.

With input and help from the GLOBE Office, Partners will be expected to familiarize candidate trainers with all appropriate aspects of GLOBE before they go to a workshop. This means exposing them to the content of the Teacher's Guide, encouraging them to spend time on the GLOBE Website if possible, and explaining the Partner's implementation goals, strategies and expectations in advance of the workshop. In fact, when possible, it is recommended that individuals attend a local teacher training workshop before attending a Train-The-Trainer Workshop. After this preparation, we hope that participants at a Train-The-Trainer Workshop won't need to ask the question "What is GLOBE about?" on the first day of the workshop.

GLOBE will still offer a single one-hour presentation integrating the International, Education and Science overviews at the beginning of each workshop. This provides review and reinforcement of the background information covered in advance, offers participants a time to ask questions, and should help all participants at a workshop share the perspective of what

GLOBE is all about.

The format of the Train-The-Trainer Workshop is where a great deal of the 'flexibility' spoken of earlier will be most obvious. It is GLOBE's objective to hold Train-The-Trainer Workshops that better prepare trainers to train teachers in methods and content areas that will achieve the objectives of their respective Partnerships. The details of this training structure will be worked out at the next Training Meeting at the GLOBE Office in March, but it is likely that Train-The-Trainer Workshops will have more hands-on experiences for the participants, model Inquiry rather than training it, and present examples of how students and scientists are using GLOBE data. Some workshops may cover only one, two or three Investigation areas rather than including all the GLOBE Protocols in a single workshop.

By the time GLOBE Trainers leave a Train-The-Trainer Workshop, they should be fully ready and motivated to complete their preparation to train on their own and to begin their implementation roles in their respective GLOBE Partnerships. It is GLOBE's objective to attract trainers who will make a long-term commitment to GLOBE, provide teacher training at least once a year, and serve as a resource for GLOBE schools in their Partnership.

CONTINUING SUPPORT:

GLOBE's goals for its Partners are that they will recruit, train, and provide continuing support to schools in their target areas and that every GLOBE school they support will report data. GLOBE also recognizes and supports Partners' goals for meeting the needs of their service areas. GLOBE intends to be a significant contributor to science and education for the indefinite future, and the GLOBE Office will continue to work with Partner Coordinators to achieve all these goals.

Furthermore, the GLOBE Office will work with Partner Coordinators to utilize, create, or modify existing tools and resources to enable them to manage implementation aspects of their Partnership more efficiently. The GLOBE Office will also provide letters and acknowledgements to Partners as requested to assist them in building learning communities and strengthening local support for their Partnerships. The framework of our current communication tools, publications, and the structure of our next Annual Conference will reflect this focus on Continuing Partner Support.

Lastly, the GLOBE Office will continue to work closely with Partner Coordinators to re-examine implementation goals and milestones on an annual basis and more often if necessary to coordinate our mutual efforts for a successful program - locally and globally - and to celebrate the achievements of GLOBE participants as we all work in partnership to:

Increase environmental awareness;
Contribute to the scientific understanding of Earth; and
Contribute to improved student achievement in science and mathematics.

10. Who is a GLOBE Teacher

At the GLOBE office, we are always trying to improve how this program works. One key to this is providing good support to our Partners. Increasingly, we realize that GLOBE must be flexible in its expectations of you and your need to be flexible in meeting the needs of teachers.

All teachers should be recognized as part of the GLOBE family as soon as they begin their training with you. Accordingly, from now on, teachers will be recognized as GLOBE Teachers when you have trained them in any protocol or set of protocols. You may give them GLOBE Teacher certificates recognizing them as full members of GLOBE, or you may choose to present them with certificates customized to suit your needs. The GLOBE database will no longer distinguish between teachers who have been given GLOBE IDs after learning one protocol and those who have completed training in all basic GLOBE protocols.

GLOBE still hopes that most partners will eventually involve the schools they serve in all areas of GLOBE science, but how that progression unfolds is up to you and your teachers. As teachers receive training in a part of GLOBE, they should be encouraged to begin implementing this part. The protocols must still be followed and training them to teachers must include at least one supervised, hands-on experience in taking the measurement. Of course, the instruments used must still meet specifications. Good quality data remains an essential requirement.

With this new flexibility, it is our hope that you will be better able to help teachers find the way to include GLOBE in their teaching, especially taking and reporting data. Partnership is the linchpin of GLOBE. We want to do everything we can to support you as you identify good teachers and help them progress to sustained, effective use of GLOBE in their classrooms and curricula.

11. GLOBE Master Trainers

In response to our Partners' request to have the capability to train GLOBE Trainers independent of the GLOBE Office, we have developed the concept of a GLOBE Master Trainer. Attached below is a description of GLOBE Master Trainers and the requirements and process for becoming one.

We will develop a database of individuals who have attained GLOBE Master Trainer status in the event that Partners want to use them to train GLOBE Trainers independent of GLOBE International Training Workshops. Many of our Partners have indicated that in the future, it would be beneficial for each region to have a group of GLOBE Master Trainers who together can train the full set of GLOBE protocols.

We want to thank our Partners for this excellent suggestion!

DEFINITION

Trainers who are certified to train GLOBE Trainers in one or more of the five GLOBE science investigation areas broken into eight groups of GLOBE measurement protocols.

CRITERIA

1. Trainer must have demonstrated capability to effectively train the entire set of protocols in a group. This includes an understanding of the science content, use of data, and the ability to report and analyze data according to GLOBE procedures in the language(s) in which they are proficient.

2. The Country Coordinator must concur that the individual can become a GLOBE Master Trainer.

REQUIREMENTS

1. Attend GLOBE Train-the-Trainer Workshop(s) and be certified as a GLOBE Trainer in all the basic and advanced protocols.

2. Confirmation from the Country Coordinator that the trainer has trained GLOBE teachers in at least two teacher training workshops.

3. Be an Assistant Trainer at a GLOBE Train-the-Trainer Workshop for a group of protocols. At the Workshop, the Assistant Trainer will train at least two protocols using the GLOBE inquiry model in addition to assisting the Master Trainer with other protocols in the group and helping set up.

4. The Master Trainer will evaluate the Assistant Trainer and make recommendations on what the Assistant Trainer needs to do prior to proceeding to step 5 (e.g., learn more material, assist at a second GLOBE Train-the-Trainer Workshop, complete web-based instruction, etc).

5. Be the Lead Trainer for a complete group of measurement protocols at a GLOBE Train-the-Trainer Workshop. Following completion of the Workshop, the GLOBE Facilitator and Master Trainer will either certify the Lead Trainer as a Master Trainer or make recommendations on what the Lead Trainer needs to do prior to becoming a Master Trainer (e.g., learn more material, be a Lead Trainer at a second GLOBE Train-the Trainer Workshop, complete web-based instruction, etc.).

6. A Master Trainer who hasn't trained Trainers in three years must participate as a Lead Trainer in a GLOBE Train-the-Trainer Workshop to refresh his/her training skills in order to retain his/her status as a Master Trainer.

NOTE: If a trainer wants to become a Master Trainer for more than one science investigations, these steps must be repeated for the second and subsequent investigations.

All GLOBE science investigators, both Principal Investigators (PI's) and Co-Investigators (Co-I's) are qualified automatically to train trainers in the area of their investigation.

Protocol Groups for Trainers and Master Trainers

Atmosphere, Basic
Atmosphere, Advanced
Phenology
Hydrology
Soil, Basic
Soil, Advanced
Land Cover, Basic
Land Cover, Advanced

12. GLOBE Training Website

GLOBE is pleased to announce the availability of the GLOBE Training website. The Training website improves the training of GLOBE data entry and visualization by providing workshop participants with a fully functioning copy of the GLOBE data system exclusively dedicated to training. It provides better performance during trainings and eliminates a number of site definition and data entry problems. The site may also be used by teachers and their students to practice site definition and data entry.

The GLOBE Training website is an almost exact copy of the GLOBE website. The only difference is that data entered through the Training website do not become part of the permanent GLOBE database. This allows practice data to be entered and visualized without becoming a permanent part of GLOBE's science data archive. The GLOBE Training website can be accessed directly via its internet address, http://training.globe.gov/ In addition, any user that logs into the main GLOBE website (www.globe.gov) using a training ID will be automatically redirected to the Training website. All training IDs begin with the letters ZZ. The words "Training Site" in light blue appear in background to clearly distinguish the Training website from the main GLOBE website.

The GLOBE Training website should be used during GLOBE training workshops so that trainees can have the experience defining a Study Site, entering data, and accessing these data via a visualization or the Data Access tool. If School IDs have been generated for the teachers, these IDs can be used on the training server. Otherwise, the teachers can use the GLOBE training ID for the workshop.

When practicing on the Training website, teachers can log in with either their School ID or with a training ID.

It is important to stress the difference between the main GLOBE website and the Training website. Data that are entered through the Training website are only held for a few days before being permanently deleted. Data that are entered through the main GLOBE website become part of a permanent science dataset for use by students and scientists for years to come. Please be sure that you and every one you train understand this difference. Teachers and students should enter their valid GLOBE measurement values on the main GLOBE website or through email using their School IDs, not a training ID.

We hope that the Training website will help you better train the use of the GLOBE computer systems. We are interested in any comments or feedback you might have on how well this works for you and how it could be made better. Please feel free to contact us with any thoughts or questions.

13. Landsat 7 Policy

Many of you have asked us to rethink our current Landsat 7 policy of providing images based on the number of schools that are in a scene (ref: May 16, 2001, Monthly Update). Instead, you have asked us to consider providing scenes as an incentive/reward to schools demonstrating a commitment to GLOBE and actively reporting data.

You told us that there is often a long gap between the time a school receives a message from GLOBE after reporting data for the first time, and when a school reports enough data to make the Chief Scientist's Honor Roll (approximately 500 measurements). You've also suggested that receiving a Landsat 7 image could be an interim indication from GLOBE that the school's hard work is really appreciated by the GLOBE Office!

We think this is a wonderful idea! Therefore, we have revised our Landsat 7 policy to reflect this change.

Please let us know if you have any questions or comments on this.

1. GLOBE will purchase Landsat 7 scenes for use at International Workshops and Symposia, for any major teacher trainings of land cover Protocols, or for other special GLOBE events such as MUC-a-thons where a Landsat image is required.

2. Once a GLOBE School reports more than 250 data observations, it meets the reporting criteria for receiving a GLOBE Landsat 7 image.

3. For a GLOBE School to be eligible to receive a Landsat 7 image, it must have a GLOBE trained teacher.

4. For a GLOBE School to be eligible to receive a Landsat 7 image, it must have defined its location using GPS derived coordinates or the equivalent.

5. GLOBE can only provide images that are available. Since Landsat 7 is relatively new, it is still difficult in some locations to find a sufficiently cloud free image.

6. GLOBE is now trying to use only leaf-on Landsat scenes. "Leaf on" means the time period before the leaves of deciduous vegetation have fallen.

7. If a Landsat 7 scene for an area is available to GLOBE without our having to purchase it and one school in that scene meets the requirement given in (2), (3), and (4) above, GLOBE will provide all the school(s) within the scene with the image products.

8. GLOBE is entering into some cost sharing arrangements with Earth Science Information Partners of NASA to split the cost of purchasing scenes of mutual interest and make image products more readily available to the schools within the applicable areas of coverage.

To achieve the above, GLOBE will continue to have access to MLRC (MultiResolution Land Characteristics Consortium) scenes, which are comprised of Landsat 7 scenes of the US made available through a combined federal (NOAA, USGS, EPA, and others) purchase.

GLOBE will look for opportunities to maximize its limited purchasing resources. Therefore, if a GLOBE Partner knows of any scientists using Landsat 7 data in their area or country, GLOBE would be interested in exploring cost sharing opportunities with them.

GLOBE will work through any backlog of schools using a queue in which schools are served scenes in the order of the dates they reported their 250th measurement. Some exceptions in the chronological order of distribution may occur when multiple schools at different places in the queue are in the same row-path Landsat scene and it is most efficient to process all the schools in the scene that meet the criteria with GLOBE products at the same time.

14. GLOBE's Approach to Ensuring Data Quality

GLOBE's Approach to Ensuring Data Quality

The data collected by GLOBE students are intended for use in research. Many parts of the GLOBE program are motivated by the need to ensure adequate data quality. This process is a partnership among GLOBE scientific researchers, trainers, teachers, students, and data systems professionals.

The foundation of data quality in GLOBE is the protocols and instrument specifications. These are developed and kept current by competitively-selected research teams who want to use the student data in their research. These protocols and specifications are clearly documented in the GLOBE Teacher's Guide.

The scientists work with the GLOBE staff to train individuals who can in turn train GLOBE teachers in how to perform these protocols correctly. Trainers are supplied with training charts to support the correct training of teachers. Each country participating in the program has a team of trainers who have themselves been trained by GLOBE in special international workshops. Within the United States, a number of institutions have undertaken the responsibility to provide GLOBE training to teachers as part of their missions. These institutions are known as GLOBE franchises and each of them has a training team whose members have been trained in a GLOBE US partner workshop.

The key to GLOBE data quality is the GLOBE teacher. These individuals receive hands-on training in the GLOBE measurement protocols from trainers certified by GLOBE and are given a copy of the Teacher's Guide which documents the protocols and instrument specifications. This Guide also provides educational materials including learning activities specifically designed to prepare students to do the protocols correctly and with understanding. Also, teachers are provided videos on how to do the protocols. The intent of these videos is to reinforce training and to complement the printed guide. Teachers can obtain help from the GLOBE Help Desk or the GLOBE Coordinator for their country, and the research groups answer teacher questions and address issues raised by both teachers and students.

Students take the GLOBE measurements under the supervision of their trained teachers. Generally, measurements are taken by teams of students so that they can check one another for accuracy and correct procedure. Often protocols specify that students take multiple measurements of an environmental property. In some cases they are asked to check that all measurements agree within the precision limits of the technique and instrumentation; where differences among various samples are too large, students repeat the measurement or discard outliers which disagree with at least two other observations. Student understanding of the measurements is another element in ensuring data quality.

To the maximum extent possible, range checks are performed on all data submitted to GLOBE. Data which fail these checks are initially rejected by the GLOBE data archive. Students and

teachers can work with the scientists to determine whether these data are actually correct though unusual or whether some mistake has been made in data collection. GLOBE provides visualizations of data in the form of maps and graphs as well as tabulations of the data to facilitate easy examination of the data by students and others. Problem data often are easily detected in these visualizations so that students can catch their own mistakes in data entry.

The data are quality controlled by the research groups who review all data submitted for their measurement protocols. Schools are contacted to resolve any questions which arise. At present, the US National Climatic Data Center is also performing quality checks on GLOBE data prior to the inclusion of these data in their data products.

In summary, the GLOBE data quality assurance process starts with appropriate protocols and instrument specifications, continues with effective training for teachers in how to take measurements, relies on trained teachers to supervise student data collection, screens data upon submission to the GLOBE archive, and concludes with the participating research groups reviewing all data for quality and resolving issues which arise with those who collected the data in question.

15. International Training Workshop Site Requirements

GLOBE International Training Workshops are frequently hosted by Country Coordinators. These workshops provide Country Coordinators the opportunity to train a large number of their own GLOBE teachers as GLOBE trainers who are authorized to train other GLOBE teachers. The workshops can also bring high level attention to GLOBE in-country by providing opportunities for press events, etc. The workshop site requirements which follow are used to help Country Coordinators identify appropriate facilities for holding International GLOBE Training Workshops and can be used to help identify workshop sites for domestic teacher training workshops as well.

The GLOBE Training Resource Room on the GLOBE Web Server provides overhead slides which can be used in making general presentations about GLOBE and in GLOBE Training Workshops. To access this site please go to http://www.globe.gov/hq/templ.cgi

International Training Workshop Site Requirements

- A large room available exclusively for GLOBE for the duration of the training workshop with seating at tables for all of the participants.

- A second room with tables that can be used as a lab. Floors and tables may be covered with plastic.

- Projection capabilities including: a large screen or white wall for projection, over-head projector, flip chart on easel, and blackboards (or whiteboards) for the indoor portions of the workshop.

- The computer laboratory should have 1 computer for every 2 participants connected to the Internet with SLIP/PPP or direct access. The appropriate software should be installed and configured to access the World Wide Web via Netscape or Mosaic. An LCD pallet for projections from a computer screen should also be available. The lab needs to be available for a minimum of 16 hours spread out as evenly as possible throughout the Training.

- Contact information for shipping (name, address, and phone number where the materials can be shipped). Someone on the Training Team in the Host country needs to count the boxes when they arrive in the country to ensure that the entire shipment has arrived and confirm its arrival to the GLOBE office.

- A room with sufficient space and security to hold workshop materials (scientific instruments and Teacher's Guides) and to allow the trainers access to the up to 30 cartons of materials. A large table should be available in this room for trainers to use for organizing and making an inventory of the instruments. The room should be available 2 days prior to the start of the workshop with the equipment already in it.

- At least 40 contact hours with the workshops participants are required by the GLOBE Training Team to adequately train the GLOBE Protocols in a Basic Training Workshop. An additional 5 one hour lunch breaks are needed along with 2 hours of breaks. Of the 40 hours, 16 should be in the computer lab. Any additional activities, such as field trips, receptions or guest speakers, need to be accommodated outside this 47 hour time frame.

- At least 17 hours are necessary to adequately conduct an Advanced Training Workshop, which include time for lunch and breaks. Of the 17 hours, 4 should be in the computer lab. Any additional activities, such as field trips, receptions or guest speakers, need to be accommodated outside this 17 hour time frame.

- Although it is not a requirement, the GLOBE Office appreciates access to one or two host country support staff to assist with local issues surrounding the implementation of a GLOBE International Workshop. In past workshops, access to a photocopier, computer and printer for the GLOBE Training Team has proved invaluable.

The specifications for the four GLOBE study sites are listed below:

Atmosphere/Climate: The GLOBE atmosphere and climate site consists of a 10 cm by 10 cm square by 2 m long post with a 50 cm by 25 cm thermometer enclosure and a rain gauge mounted on it. These should be located on a flat, grass covered area, at least 5 meters away from trees or buildings. This study site should be in close proximity to the indoor workshop site.

Hydrology: The GLOBE hydrology site requires safe access to surface water of any stream, river, lake, bay, sea shore, or pond within 15 minutes transportation time of the indoor workshop site. Observations of water temperature, transparency and dissolved oxygen must be conducted at this site. 10 liters of distilled water should be available for the trainers.

Land Cover/Biology: The GLOBE Land Cover/Biology protocols are best done at a natural forest or woodland and a grassland site. For training, natural means not watered, irrigated, mowed, or planted with decorative, non-native plants. Ideally, this site should be a square measuring 90 m by 90 m that is homogeneous in vegetation cover (clearings and paths within the site are fine). The site must be within 15 minutes transportation time of the indoor workshop location. If an ideal site is not available, the protocols can be trained on a 30 m by 30 m site, in a stand of trees in a park, or in a grassy field. If teachers attending the training come from schools where forests are the primary form of natural land cover, the grassland site may be omitted, or if those attending come only from grassland areas, the forest site may be omitted. In the grassland site, permission is needed to clip at least a 1 m by 1 m square to the bare ground (this should not kill the grass).

Soil: The GLOBE Soil site is an area where one can dig to a depth of 1 meter. Natural areas or parks where the soil has not been disturbed are ideal, but any location where there are at least 2 distinct layers in the top meter of soil is acceptable. Permission to dig a 1 m deep soil pit is desirable, but the protocol can be taught using an auger to remove soil samples. Some additional surface soil will also be disturbed. The site should be as close as possible and must be within 15 minutes transportation time to the indoor workshop location.

Note: By transportation time we mean the time it will take to get teachers from the indoor site to the other field site using whatever means of transport will be available (e.g. walking or some sort of van or bus).

16. Information on GLOBE Logo and Trademarks

The GLOBE logo and trademarks are property of the United States Government and are available for use by GLOBE Partners in their GLOBE activities. Information about the use of the GLOBE logo and trademarks follow.

The GLOBE Program ®

GLOBE ®

GLOBE STARS ™

***GLOBEMail*™**

And the GLOBE logo:

February 23, 2001

The GLOBE Program is pleased to license the GLOBE Program in each partner country to use U.S. Government GLOBE registered trademarks in materials prepared and distributed in hard copy or electronic form as part of activities directly related to participation in the GLOBE Program.

This license for use of these registered trademarks includes use in raising funds or other resources to support participation in the GLOBE Program, such as producing and selling items like T-shirts, mugs, and mouse pads. The trademarks may not be used to raise funds or other resources for purposes other than the GLOBE Program.

Trademarks that may be used are:

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Each time one of these registered trademarks is used, the registered trademark should be marked with the "®" symbol, as shown above, except when redundant or repetitive uses of the symbol might appear awkward or cumbersome, such as in the body of a letter. In such repetitive use, the symbol should be applied the first tie the trademark is used. This license is being grated by the U.S. Government, which reserves the right to monitor use of these trademarks, including inspecting goods or services on which the trademarks are being used, and to withdraw its consent for use of these trademarks or change the guidance for their use at any time. The trademarks should be used under circumstances that represent good taste, and must not be used in any way that could be construed as endorsing any products, service, organization, or point of view not directly associated with participation in the GLOBE Program. The use of these trademarks my not be sublicensed to any other organization or individual, and the trademarks may be used only while the partner country is a participant in the GLOBE Program. If there are any questions about

the use of these trademarks, please contact Ms. Lyn D. Wigbels, GLOBE Assistant Director for International Programs, at 202-501-3200.

We encourage the use of these trademarks to show our pride in being part of this exciting, international environmental science and education program.

Tom Pyke
Director
The GLOBE Program

17. GLOBE IDs and Passwords

17.1 Training Workshop IDs
17.2 Process for Obtaining Country Coordinator IDs
17.3 Process for Obtaining School IDs
17.4 Instructions for Changing School Passwords

17.1 Training Workshop IDs

At all training workshops, use the following:

ID: ZZZZTEST
Password: SGLOBE2

Use of the above ID and Password at training workshops will allow your teachers to practice using the data reporting and GLOBEMail features of the GLOBE Server, but the data will not be archived and the messages will not actually be sent.

Please note: the ID and Password must be in ALL CAPITAL LETTERS!

17.2 Process for Obtaining Country Coordinator IDs

The GLOBE Office will generate and send each Country Coordinator an ID that will allow them to easily review the status and activity of the GLOBE schools in their country.

Once a Country Coordinator has their ID, they may use it to logon to the GLOBE Website the same way a GLOBE school does by clicking on the "GLOBE Schools Login" link just under the GLOBE Banner on the GLOBE website at <http://www.globe.gov>.

Once they have logged in with their Country Coordinator ID, they should then click on the "Administration" link on the left side of the tool bar to use the Country Coordinator Administration Tools outlined in Section 13 below.

In order to use GLOBEMail, one must log onto the GLOBE Server with an ID and Password. Because GLOBE Country Coordinators may wish to use GLOBEMail to communicate with their GLOBE schools (for example, to send congratulatory messages for their program activity or to alert them to an upcoming national event), they are provided a Country Coordinator ID. In addition, this Country Coordinator ID will enable Country Coordinators to use the GLOBE data entry forms on the GLOBE Server in a practice mode. Therefore, Country Coordinators can use their IDs to practice submitting data with their teachers, but the data submitted using these IDs will not be entered into the data archive, nor will it be included in the development of GLOBE images.

It is important to emphasize that GLOBEMail, by design, does not provide the capability to broadcast a message to more than one addressee. If a Country Coordinator wishes to communicate simultaneously with all GLOBE schools in the country, setting up a listserv over e-mail would probably be the best approach. For example, Australia and Finland have developed listservs to communicate with their GLOBE schools. In addition, the Country Coordinator ID will not allow GLOBE schools to initiate GLOBEMail communications with a Country Coordinator. The schools will be able to respond to a message sent to them, but there is no way for them to start a message chain since the Country Coordinators are not listed as GLOBEMail addresses on the GLOBE Server.

The GLOBE Country Coordinator ID is provided to Country Coordinators with access to the World Wide Web when their country signs the GLOBE agreement. The GLOBE Office will provide Country Coordinators who do not have access to the Internet an overview of their country's status upon their request.

17.3 Process for Obtaining School IDs

After attending a GLOBE International Train the Trainer workshop, GLOBE trainers are certified to train other teachers to become certified GLOBE teachers.

For Country Coordinators who have access to the World Wide Web, Coordinators can produce their own school IDs using the GLOBE Country Coordinator Administration Tools discussed in Section 10.4 below.

Country Coordinators who **do not** have access to the World Wide Web should send a letter to the Assistant Director for International Programs certifying that GLOBE teacher(s) have been trained at a GLOBE workshop, and include a GLOBE School Profile form for each school with a trained GLOBE teacher. The GLOBE Office will then process these school ID requests and send the GLOBE school IDs to the Country Coordinators to provide to the new GLOBE schools. The GLOBE School Profile form is provided below.

GLOBE SCHOOL PROFILE FORM

The Country Coordinator is requested to provide the following information on their country's GLOBE schools. Please return to the GLOBE Assistant Director for International Programs at the address below.

Lyn Wigbels
Assistant Director for International Programs
The GLOBE Program
1800 G. St., NW
Washington, D.C. 20006
Fax: (202) 501-5060
E-mail: <lwigbels@globe.gov>

Please type or print clearly

Part One: Country Coordinator

Name:

Address:

Phone Number: Fax Number:

E-mail address:

Part Two: Please complete the following information for each GLOBE school

Teacher name:

Principal name:

School name:

School Address:

Phone Number: Fax Number:

E-mail address:

School Webpage:

School Latitude and Longitude:

School Elevation:

Approximate start date for GLOBE operations:

GLOBE school computer information (optional)

What type of computer will be used for GLOBE?

About the computer's peripheral equipment (optional)

Does the system have a communications modem?

Internet connectivity

Is the computer connected to the Internet?

If yes, can the school send and receive electronic mail (e-mail) via the Internet?

What is the school's e-mail address?

What is the school's homepage address, if it has one?

Does the school have a graphical World Wide Web Browser like Netscape or Explorer

17.4 Instructions for Changing School Passwords

Country Coordinator may change/reset GLOBE school passwords using the Country Coordinator Administration tools mentioned in Section 10.4 above.

Schools may also change their own passwords by following the procedures outlined below.

To connect to the GLOBE Server start by "launching" a World Wide Web browser such as Netscape or Internet Explorer. Once you have accessed the browser, type in the "location" for the GLOBE Server <http://.www.globe.gov>. Log in as a GLOBE school by clicking on "GLOBE Schools Login" at the top of the menu on the left side of the page. You will be given the following window:

User Name: USXXXXXX
Password: *******

Enter your GLOBE School ID as the "User Name." Be sure to use all capitalized letters.
FYI: Your GLOBE School ID consists of 8 digits and is determined by your Country, State, and a randomly generated code: Example: USCAXXXX=

US / CA / XXXX

COUNTRY / STATE / SCHOOL SPECIFIC CODE

Your school's original password is **SGLOBE2**, also capitalized. (Note: when you type your password, it will appear as a series of asterisks.)

If you want to change your school password from the original, **SGLOBE2**, you can do this by checking on "Change Password(s)" under "Administration" on the menu on the left side of the page, and follow the instructions. Start by entering your "Current School Password" which initially is **SGLOBE2**. Further down the page, you will be able to change your school password whenever you wish. In creating new password(s), remember to use six to eight characters, with all letters capitalized, and with at least one number.

18. Country Coordinator Administration Pages

To use these pages, log in to the GLOBE Web site "http://www.globe.gov/" and with your Country Coordinator ID and password. Using your ID and Password, you can then enter the Admin tools. If you do not have your ID or Password, please contact Ms. Lyn Wigbels, Assistant Director for International Programs <lwigbels@globe.gov>, at the GLOBE Office for assistance.

The following is a description of the new Country Coordinator Administration Tools that you will find at the "Administration" link on the tool bar after you have logged in:

Add a School and/or Teacher:

This allows Country Coordinators to generate GLOBE School IDs for Schools that have a trained GLOBE teacher. Country Coordinators no longer need to request GLOBE school IDs from the GLOBE Office. Country Coordinators may also add GLOBE Teachers to the GLOBE Website using this link.

Modify a GLOBE School:

Country Coordinators can use this tool to update information about a GLOBE School in their country.

Modify a GLOBE Teacher:

This tool will allow Country Coordinators to change/update information about current GLOBE teachers in their country.

Change a School Password:

Country Coordinators can reset a GLOBE school's password to **SGLOBE2** using this tool.

School Status:

This tool allows you to check the status of all the schools in your country. Schools are divided into 3 categories: Currently Reporting (in past 3 months), Never Reported, Have Reported in the Past (more than 3 months ago). You can organize the list of schools by school name, city, date of first report, date of most recent report, and the number of observations done by that school. Teacher name, teacher email, school phone number, and GLOBEMail are also provided.

School ID Report

This tool allows Country Coordinators to see and print a list of all the GLOBE school IDs in their country.

Mass GLOBEMail

This tool allows you to send a GLOBEMail to all schools in your country. Every teacher that has their email address in our database will also receive an email message telling them to look at their GLOBEMail (optional). You select when the message should be deleted.

Change Your Country Coordinator Password:

This allows Country Coordinators to change their own passwords from the default password: **SGLOBE2**

Change School / Teacher Password

When a teacher forgets their password, please reset it to **SGLOBE2** using this tool. You will need to know their School ID.

Chief Scientist Honor Roll in (Your Country):

Country Coordinators can use this tool to quickly see all the schools from their country on the Chief Scientist's Honor Roll.

GLOBE Stars in (Your Country):

This tool is a shortcut to the area of the GLOBE Stars Hall of Fame on the GLOBE Website.

GLOBE Partner Country (Your Country):

This is a shortcut to your country's GLOBE Country Page on the GLOBE Website.

GLOBE Stars Certificates

These certificates are to be printed out and given to special GLOBE students.

To logon to the Country Coordinator Administration Tools, simply click on the "GLOBE Schools Login" link on the GLOBE homepage. Use your Country Coordinator ID and password to logon the website, and then you will automatically be directed to the Country Coordinator Administration Tools. The GLOBE Office is delighted to provide Country Coordinators with their Country Coordinator IDs and passwords if they need them.

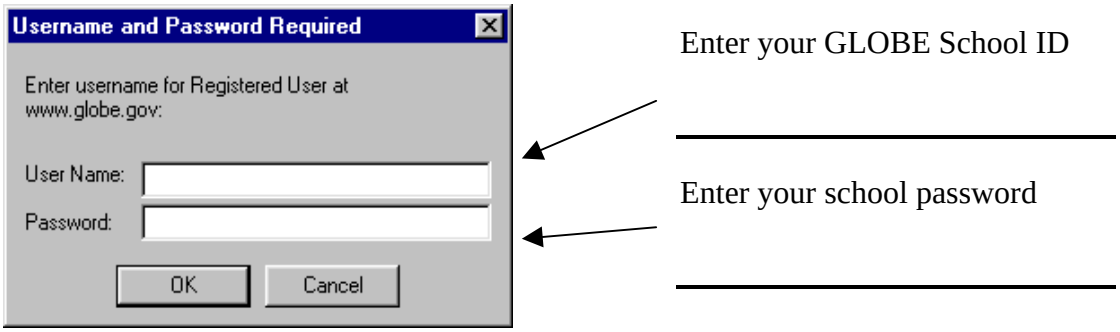
19. Data Entry Quick Reference

Be sure to fill out your data collection sheets accurately and completely in the field. You must login to the GLOBE server to be able to enter data. You must have a study site defined for an investigation before you can enter data for it. After you enter your data, be sure to save the data collection sheet in your GLOBE Data Notebook.

LOGIN

1. Start at the GLOBE Homepage http://www.globe.gov/
2. 3Select "GLOBE Schools Login" from the navigation bar at the left.
3. When you see the login box (shown below), enter your GLOBE school ID and password, both in all uppercase, and then press the enter key or click the OK button.

NOTE: New GLOBE School IDs **do not** contain the numbers 0 or 1. This is to avoid confusion with the letters I and O.



STUDY SITE DEFINITION

If this is the first time you are entering data for a particular study site location, you must define the study site before you enter measurement data. You need to define each study site only once. Define the study site to the best of your knowledge. You can go back later and edit the information if you need.

1. Login
2. Select "Data Entry" from the navigation bar on the left.
3. Under the heading "Study Site Definition", select "Define or Edit a Study Site"
4. You will see a heading for each GLOBE investigation (e.g. Atmosphere, Hydrology, etc.). If you are defining a new site, select "Define a New Site" under the appropriate investigation heading. If you are editing an existing study site definition, select it by name.
5. Enter all requested information to the best of your knowledge. Required information is indicated with a red asterisk (*). Time must be specified in universal time (UT). See section on UT below.
6. When all fields are filled out, click on the **Send** button to submit the data.
7. The information symbol (at right) indicates that there was a problem with the site definition data as sent. You need to take some action to correct the data and resend it. Read the instructions next to the symbol to learn what the problem was

and how to correct it. Make the required changes and click on the **Send** button.

8. When your site definition is received and accepted, the system will respond with "Your input has passed system checks!" and a smiling face symbol (at right). Double check the information against your data collection worksheet and save the worksheet in your GLOBE Data Notebook.

DATA ENTRY

1. Login
2. Select "Data Entry" from the navigation bar on the left.
3. You will see a heading for each GLOBE investigation (e.g. Atmosphere, Hydrology, etc.). Select the appropriate protocol under the investigation heading (for example, Hydrology – Surface Water Measurements).
4. Enter the time and date that the measurement was taken, not the time and date the measurement is being entered. Time must be specified in universal time (UT). See section on UT below.
5. If you have more than one study site defined for an investigation, be sure to select the correct one from the pull-down list.
6. Other required information is indicated with a red asterisk (*).
7. If you haven't taken a measurement and it is not a required field, just leave it blank.
8. When all fields are filled out, click on the **Send** button to submit the data.
9. The information symbol (at right) indicates that there was a problem with the measurement data as sent. You need to take some action to correct the data and resend it. Read the instructions next to the symbol to learn what the problem was and how to correct it. Make the required changes and click on the **Send** button.

10. When your measurement data is received and accepted, the system will respond with "Your input has passed system checks!" and a smiling face symbol (at right). Double check the information against your data collection worksheet and save the worksheet in your GLOBE Data Notebook.

UNIVERSAL TIME

To convert your local time to UT, first make sure your local time is in 24-hour format (e.g., 1:00 p.m. is 1300). Then consult a time zone map to figure out how many time zones your site is away from Greenwich, England, which is still the reference site for UT. Once you have found the difference between your local time and UT, add or subtract that difference from your local time. The resulting time is in UT.

If you live in an area that uses Daylight Savings Time, the amount that you add to your local time will be one hour less during the summer, when Daylight Savings Time is in effect. For example, in the U.S., seven hours are added to Pacific Standard Time to convert it to UT during the summer, while eight hours are added during the winter.

Sometimes it may be difficult to determine where you are on the time zone map. For instance, the map may display the entire world and not show much detail of any particular region. You may live near a time zone boundary and not be sure on which side of the line you fall. If this is

the case, you may want to look at the current time displayed in UT on the Atmosphere Investigation data entry sheet and compare that time with your local time. Once you have calculated the difference, you can apply this correction to the times of your observations. **Always be sure to enter the time that your measurement was collected, and not the time that you are entering it into the computer.**

20. Spreadsheet E-Mail Data Entry Instructions

The instructions for submitting GLOBE student data via e-mail follow. Spreadsheet E-mail data entry can be used by any GLOBE school or any Country Coordinator on behalf of their GLOBE schools. The information below can also be found at the following website:

http://www.dhba.com/globe/bulkdata/

GLOBE Spreadsheet Data Entry

This is a system for entering large backlogs of GLOBE data via a spreadsheet. Data is entered into a spreadsheet, the formatted spreadsheet data is cut-and-pasted as text into the body of an e-mail message, and the message is sent to GLOBE. The GLOBE server processes the message and provides range checking and feedback to the user via e-mail.

This is now **provisionally** operational. You may download the spreadsheets, fill them out, and send them in, but please contact me first. If you have any questions or comments, send me e-mail at dhbrown@globe.gov.

- Instructions
- Atmosphere Spreadsheet
- Hydrology Spreadsheet
- Soil Characterization Spreadsheet
- Soil Moisture, Temperature, and Infiltration Spreadsheet
- Biology and Landcover Spreadsheet

Instructions

Spreadsheet Data Entry

PLEASE READ THESE INSTRUCTIONS FULLY AND CAREFULLY BEFORE ENTERING ANY DATA. IF THE SPECIFIED FORMATS ARE NOT FOLLOWED EXACTLY, YOUR DATA WILL NOT BE ACCEPTED AND YOU WILL HAVE RE-ENTER IT.

Introduction

These spreadsheets have been developed to allow the entry of large amounts of GLOBE data at one time. This capability is being provided in response to requests from GLOBE teachers to reduce the time required to enter large backlogs of data. This is a prototype system based on an existing capability to accept GLOBE data via e-mail. This e-mail data entry system was created to support areas of the world with limited Internet access. Since it supports a relatively small

user base, it is not as fully featured as the web version and may not be compatible in all functions. As always, you should examine your data in the GLOBE archive to make sure it was received and recorded correctly. A full description of the e-mail data entry system with many examples can be found at http://www.globe.gov/hq/charts/handouts/emailent.htm.

Overview of the Procedure

Step 1- Enter Data into the Spreadsheet

There are 5 different spreadsheet templates, one for each investigation; Atmosphere, Hydrology, Soil Characterization, Soil Moisture (including Soil Temperature and Infiltration), and Land Cover/Biology. A description of how to format the data for each protocol is included in the spreadsheet. After the format description, you will find a row of column headers corresponding to the data expected in each column. Below this you will see a row that contains only **//AA** in the first cell, then several empty rows, then a row that contains only **//ZZ** in the first cell. **ALL OF YOUR DATA MUST APPEAR BETWEEN THE //AA AND //ZZ ROWS.** Data that is not in between these rows will be ignored. You may insert as many new rows as necessary to accommodate all of your data. You must fill out every cell in the row, even if the data is the same in one column from row to row (e.g. school ID). If you are missing a value, use the letter X in the corresponding cell. All fields must contain a value or an X; blank cells will result in errors. (see below "Missing Data"). You may include data from different days, different study sites, and even different schools in the same spreadsheet.

Step 2 - Paste the Spreadsheet Data into an E-mail

The next step is to create an e-mail message that contains the formatted data from the spreadsheet. Do this by selecting all of the data in the spreadsheet, copying it, and then pasting it into the body of an e-mail message. If you are not familiar with the concepts of copying and pasting data on your computer, check your system's documentation or help files, or find a local computer expert to help you. **Do not send the spreadsheet as an attachment to your e-mail.** The data must be in text form as part of the body of your e-mail message.

Step 3 - Send the E-mail to GLOBE

Send the e-mail to the following address:

data@globe.fsl.noaa.gov

You must use the following as the subject line:

data2

It may take up to a few days for your data to appear in the archive. When it does appear, be sure to check to see that the data in the database matches what you recorded in your GLOBE data notebook.

Site Definition and Site Number

Unless you have no access to the web, all site definitions must be done via the GLOBE website. Remember that site definitions only have to be done once per study site. If you haven't defined the site you are entering data for, do that first before trying to submit data via any method.

To enter data via spreadsheet, you will need to know the study site's number. To find the number, login to the GLOBE website and go to the data entry page for the protocol you are reporting. Next to the words "Study Site Location" you will see a pull down list which contains all of your currently defined study sites for this protocol. Next to each site name is the one or two digit number that you will use to indicate the study site in the spreadsheet data entry. If you only have one study site defined, it will normally be number 1. Use the number only, not the name.

General Format for Measurements

The measurements for each protocol are entered in the spreadsheet, each on a separate line. Each line contains information about which protocol is being reported, when and where the measurement was made, and what measurement values were recorded. Each piece of information is in its own cell in the spreadsheet. The GLOBE computer will interpret each piece of information in the line based on its position in the line. We call each position a field and the first field is the one on the left.

Field 1

The first field on a line is always a character code for the protocol being reported.

Field 2

The second field on a line is always the School ID of the school whose data is being reported in that line. The school ID is an 8-character code that uniquely defines each school to the GLOBE data system.

Field 3

The third field on a line is always the one or two digit site number. If you have only one site for a given protocol (for example, one weather station), you will normally enter "1" in this field.

Field 4

The fourth field on a line is always the date and time the measurements were taken in Universal Time (UT). The format for the date and time must be exactly as shown below:

YYYYMMDDHH

The first 4 characters are the year, the next 2 characters are the month, the next two characters are the day, and the last two characters are the hour. Do not use any spaces. Do not include the letters "UT". You must use two characters for the month, day, and hour (truncate the hour). If the month, day or hour are less than 10, use a zero to make it two characters long. For example, if the measurement were taken on March 8, 1997 at 1:45 UT, it would be written as:

1997030801

Remember that you must report the date and time that the measurement was taken, not the date and time that it is being reported. You must also be sure that you report the time in UT, also called Greenwich Mean Time (GMT). Remember that the difference between UT and your local time will change if you switch between standard and daylight savings time. Also note that the month is given before the day.

Remaining Fields

The remaining fields on a line will contain the actual measured values for that protocol. Each spreadsheet contains the field definitions for each protocol in that measurement group. You can also refer to the on line e-mail data instructions at http://www.globe.gov/hq/charts/handouts/emailent.htm , which contain numerous examples.

Missing Data

Sometimes, there will be a field defined for which you have no data because you did not do that part of the protocol, or because the value was lost or corrupt. In these cases, you must place an "X" in that field, so that the GLOBE computer will know that there is no data to input for that field. **All fields must contain some value. Blank cells will result in errors.**

Questions

If you have any questions about how to use these spreadsheets or how to submit them to GLOBE, please contact David Brown at dhbrown@globe.gov or Lyn Wigbels, Assistant Director for International Programs at: <lwigbels@globe.gov>.

21. Looking At Data – Visualization Quick Reference

The best way to learn to use the GLOBE tools for looking at data is to use the tutorials available from the main GLOBE visualization page. From the GLOBE homepage (http://www.globe.gov/) select "Visualizations" from the navigation bar at the left, and then follow the links to the tutorials.

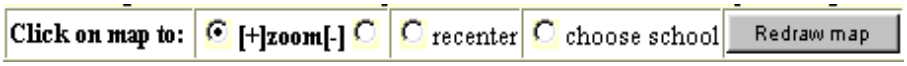
CREATING A MAP

4. Start at the GLOBE Homepage http://www.globe.gov/
5. Select "Visualizations" from the navigation bar at the left.
6. Select "GLOBE Maps".

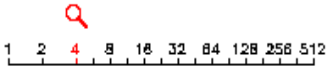
You will now see a map of the whole Earth, displaying GLOBE student maximum air temperature data for the current day.

To Change Map Center Location and Map Magnification (Zoom)

- Be sure the "Click on map to:" control (shown below) has the small circle next to "[+]zoom" filled in with a dark spot. If this circle is not filled in, click in the small circle one time.



- Click on the map. You will get back a new map, centered on the location you click, at twice the magnification of the previous map.
- To change the magnification without changing the center location, use the zoom bar (shown at right). The current magnification level is shown in red. Click the desired magnification on the zoom bar to change it.



- You can change the map center without changing the magnification, change the "Click on map to:" control so that the small circle next to "recenter" is filled in with a dark spot. Click on the map. You will get back a new map, centered on the location you click.

To Change Map Type, Date, and Map Size

- Click on the small down arrow to the right of the current value for the parameter you wish to change.
- Click on the desired new value.
- Click "Redraw Map" to make the change.

To Change Dataset (for example to a different GLOBE measurement, like surface water pH)

- Click on the name of Dataset from the list " Datasets for this map type". You may need to scroll through this list to see all of your choices.
- Click on the name of the desired dataset.
- Click on "Redraw Map" to make the change.

To Change Data Source (for example from GLOBE Student Data Measurements to Satellite and Model Reference Data)

- Click on the small down arrow to the right of the current value for "Data Source". You may need to scroll your main window down to see this.
- Click on the name of the data source you wish to use (for example "Geophysical Data").
- Click "Redraw Map" to update the list of available Datasets from the new Data Source.

To identify one school from the map, see its reported value, and learn more about that school

- Change the "Click on map to:" control so that the small circle next to "choose school" is filled in with a dark spot. Click on the map. You will get back the same map, and below it a table of the names of and data from schools that are close to where you clicked.
- To learn more about the school, including postal address, teacher's name, and e-mail address if available, click on the name of the school in the table above.
- To create a graph of the school's data:
  - Select the school by clicking in the square check box next to the school's name.
  - Click on the small down arrow and select "Make a Graph" from the list just above the table.
  - Click on "Go".

To see a list of all schools on the map, list their reported values, and learn more about them

- Click on the small down arrow to the right of the current value for "Other Options". Select "Show Table", and then click on "Go".
- To learn more about any school, including postal address, teacher's name, and e-mail address, click on the name of the school in the table above.
- To create a graph of the school's data:
  - Select the school by clicking in the square check box next to the school's name.
  - Click on the small down arrow and select "Make a Graph" from the list just above the table.
  - Click on "Go".

CREATING A GRAPH

1. Start at the GLOBE Homepage http://www.globe.gov/
2. Select "Visualizations" from the navigation bar at the left.
3. Select "GLOBE Graphs". You will now see the visualization search page.
4. Use the search page to find the school whose data you want to graph (see Search section below).
5. Select the school by clicking in the square check box next to the school's name.
6. Make sure that "Make a Graph" is the selected option in the list just above the table.
7. Click on "Go".

You will now see a graph of the selected school's maximum air temperature data.

To Change Date Range

- Click on the small down arrow to the right of the current value for the date you wish to change.
- Click on the desired new value.
- Click "Redraw " to make the change.

To Display Multiple Datasets from One Location

- Select the first desired measurement by clicking on its name in the dataset list (for example Rainfall or Soil Temperature at 5cm)
- To add additional datasets, hold down the CTRL key (on a PC) or the Option key (on a Mac). You may select a maximum of six datasets.
- Click "Redraw " to make the change.

To Display One Dataset from Multiple Locations

- Select the first school as described above.
- Click on the small down arrow to the right of the current value for Other Options and select "Add or Change Schools", then click on "Go".
- Use the search page to find the addition school or schools whose data you want to graph (see Search section below).
- Select the school by clicking in the square check box next to the school's name.
- Make sure that "Make a Graph" is the selected option in the list just above the table.
- Click on "Go".
- Repeat the process to add up to a total of six schools.

To Display and Download the Data Values Used to Create the Current Graph

- Click on the small down arrow to the right of the current value for Other Options and select "Show Table", then click on "Go".
- Scroll down to see the data.
- To download the data, scroll all the way to the bottom of the page and click on the button labeled "Create a data file".
- Save the resulting page of text onto your computer using your web browser's "Save As…" function under the "File" menu.

SEARCHING FOR SCHOOLS

1. Start at the GLOBE Homepage http://www.globe.gov/
2. Select "Visualizations" from the navigation bar at the left.
3. Select "Search" or "GLOBE Graphs". You will now see the visualization search page.

IMPORTANT: Any time you specify more than one search item, the search will return only schools that satisfy all items. For example, if you specify just the country Benin, you will get all GLOBE schools in Benin. If you specify just the school name Lycee, you will get all GLOBE schools whose name contains Lycee. If you specify the

school name Lycee and the country Benin, you will only get GLOBE schools whose name contains Lycee that are located in Benin.

To Search for Schools by Name, City, Country, or State/Province

- Enter the name of the school or school city in the "SCHOOL AND/OR CITY NAME" section of the search page
- Enter the name of the country in the "SCHOOL LOCATION" section.
- Click on the "Start Search" button to start the search.

To Search for Schools within a Range of Latitude and/or Longitude

- Click on the "More Options" button.
- Click on the "Lat/Lon Regional Search" button in the "SCHOOL LOCATION" section.
- Enter the range of latitude and longitude values. Use a minus sign (-) to indicate latitudes south of the equator and longitudes west of the prime meridian. To bound only latitude, leave the longitude values blank.
- Click the "Start Search" button.

To Search for Schools within Some Distance of a Given Latitude and/or Longitude

- Click on the "More Options" button.
- Click on the "Lat/Lon Point Search" button in the "SCHOOL LOCATION" section.
- Click on the small down arrow to select the desired distance under "Point Search".
- Enter the latitude and/or longitude values. Use a minus sign (-) to indicate latitudes south of the equator and longitudes west of the prime meridian. Find schools with some distance of a given latitude, leave the longitude values blank.
- Click the "Start Search" button.

To Search for Schools within a Range of Elevations

- Click on the "More Options" button.
- Specify the minimum and maximum elevation in the "SCHOOL ELEVATION" section.
- Click the "Start Search" button.

To Search for Schools with a Large Amounts of Data

- Click on the "More Options" button.
- Specify the minimum amount of data for up to two different protocols in the "NUMBER OF DATA REPORTS" section.
- Click the "Start Search" button.

22. GLOBE E-Mail Listservs

The GLOBE International Listserv:

The International Listserv provides a forum for GLOBE Country Coordinators to communicate with each other about matters relating to programmatic updates and special GLOBE events. All Country Coordinators with e-mail addresses are subscribed to the listserv when their country joins the GLOBE Program. Quite a few GLOBE Country Coordinators do not have Internet connections, so all listserv correspondence is faxed to these individuals by the GLOBE Office.

To send messages to all of the GLOBE Country Coordinators, address your e-mail message to: <intl-partners@globe.gov>, and all of the GLOBE Country Coordinators with access to the Internet will receive the message.

The GLOBE Teacher's Listserv:

The GLOBE Teacher's Listserv was developed for GLOBE teachers throughout the world to share their ideas and plans for GLOBE in their schools. All teachers are encouraged to subscribe.

To subscribe to the GLOBE Teacher's Listserv, send an e-mail message to: teachers-request@globe.arc.nasa.gov

With the body of the message containing only:
subscribe (replace with 'unsubscribe' to remove your address)

To send a message to the list, send your message to:

teachers@globe.arc.nasa.gov

23. Information Requirements for GLOBE Stars, Bulletins, Announcements….

The following information is would greatly facilitate the GLOBE Office in developing GLOBE STARS, Bulletins, announcements, and "OFF-LINE" stories for our Partners.

WHO is involved?:
Tell whether students, teachers, or officials were involved. Name the lead teacher and top official and the name of the sponsoring organization.

WHAT are they doing?:
Are people just talking, or doing protocols, or visiting somewhere....?

WHY did this event occur?:
What is the purpose of the event? What are its goals?

WHEN?:
Please provide us with all relevant dates

WHERE?:
What city or town is the school or event located in? Name the specific site if it is important or famous (such as the Great Wall or the Rhine river)

WHO SAID WHAT?:
Please provide brief statements (quotes) of a few people who are important. This type of information makes the story come "alive." Try to include a student quote if young people are involved. Have the speakers address different issues such as
- it was fun
- it was educational
- it was successful
- it was important to the future of the program

PHOTOS are important, especially if they show people in action -- doing something more than talking. The best photos only have a 2-4 people in them, as otherwise they get too crowded to be attractive to the readers on the web. An exception would be a shot with lots of folks in the background with a dramatic-looking object capturing the center/front.

<u>Web Chat... what is needed:</u>

WHO:
- name, title
- credentials (work background)
- some bio (work, education, pert personal)

WHEN:
- day and time (ET and UT)

24. Writing a GLOBE News Release

Five points are important to a good news release: **Who, What, When, Where** and **Why.** If possible, a sixth, **How**, should be included. It is important to get all these points in the first sentence or two. Use short words and write short sentences and short paragraphs. Two sentences make a good paragraph in a news release. Almost every news release can be written on one or two typewritten pages.

Remember

- Always give exact date, time, and location of your event, including the location for media parking and specific entrance information.
- Provide at least a two- or three-sentence description of the overall GLOBE Program, including information on the number of schools and countries involved.

  (Check the GLOBE Home Page at http://www.globe.gov for up-to-date information.)
- Check every point of your release for accuracy. Never guess on dates, times, places, or spelling of names.
- Put school contact person and phone number at the top corner of the release, and print the release on school letterhead.

Sample Press Release

(Contact Name/#/School)

LOCAL STUDENTS ASSIST WORLD SCIENTISTS COLLECT ENVIRONMENTAL DATA

Students at **(NAME OF SCHOOL)** are joining an international network of young people taking scientific measurements of Earth systems and sharing their observations with other students and scientists around the world using state-of-the-art technology systems.

(NAME OF SCHOOL) is joining the Global Learning and Observations to Benefit the Environment (GLOBE) Program, an international environmental science and education partnership. GLOBE students are contributing to a better understanding of the planet by making regular environmental observations at thousands of locations around the world and sharing their information via the Internet.

(Teacher's Name) attended a workshop with GLOBE scientists and educators for instruction on the measurement procedures and the GLOBE computer technology system.

(INSERT GLOBE TEACHER QUOTE)

Students will select a study site near the school where they will take regular measurements of various atmospheric, hydrological, biological, and geological features. The students will then send their findings via the Internet to a GLOBE data processing facility. Their data will be combined with input from other GLOBE schools around the world and with other science sources, such as satellite imagery, to create dynamic, online images of the Earth. The GLOBE student data is available to the general public on the World Wide Web at http://www.globe.gov.

The GLOBE Program is jointly funded and coordinated by the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the National Science Foundation, the Environmental Protection Agency, and the U.S. Departments of State and Education. **(Insert: Local support for GLOBE activities is being provided by ...)**

For more information, contact **(Insert GLOBE Teacher Name and phone number)**

25. List of GLOBE-Related URLs

A list of GLOBE-related URLs on the World Wide Web is available in the GLOBE Resource Room which is accessible from the Welcome Page on the GLOBE Server (at http://www.globe.gov). The list can be found by clicking on "GLOBE General Information and Training Materials." Next, click on "Systems." A copy of this list follows.

GLOBE Related URL's:

GLOBE Website	http://www.globe.gov This is the website where you will be able to enter data, look at visualizations, use the student data archive, read letters from the GLOBE Scientists, check your GLOBE Mail, etc. It is the main page for all GLOBE schools.
Multispec Software	http://dynamo.ecn.purdue.edu/~biehl/MultiSpec/Index.html This is where you will be able to download the newest version of MultiSpec which is image processing software. You will be able to view the Landsat TM image of your study site using this software.

Web Sites Related to GLOBE Science Investigations

Atmosphere

The NOAA Weather Page	http://www.nws.noaa.gov The latest weather information from the forecasts offices and National Centers, climate statistics and historical archives of observational reports and weather products, information on hydrometeorology, the environment, geophysical tables, weather communications, codes & standards, and other weather related services, and all about the National Weather Service (NWS) organization.

Hydrology

U.S. Geological Survey	http://h2o.cr.usgs.gov USGS has gathered a large amount of hydrological and atmospheric data on its web page. Satellite data on rivers is available, including data such as mean daily water flow, current water flow, stage, temperature, and the date and time in which the data was last updated. This information is available by clicking on a particular U.S. state on the image map. Another image map is available that highlights different stations in a particular U.S. state.

Agencies That Support GLOBE

NASA Home Page	http://www.nasa.gov
National Science Foundation	http://www.nsf.gov
Dept. of Education	http://www.ed.gov
Dept. of State	http://www.state.gov

Educations Programs That Relate to GLOBE

The JASON Project	http://www.jasonproject.org The JASON Projects emphasizes an advanced approach to teaching and learning in which teachers become 'facilitators' or 'managers' of the learning process for their students. The JASON Project integrates multiple program components that help others to understand and connect with the national Education Goals.
The Eisenhower National Clearinghouse	http://enc.org The Eisenhower National Clearinghouse (ENC), the nationally recognized information source for K-12 mathematics and science teachers.

Weather Web Sites

Project Atmosphere	http://www.met.fsu.edu/explores/resources.htm The overall goal of Project Atmosphere is to promote study in science, mathematics, and technology from the K-12 levels by employing atmospheric topics, information and data. Environmental topics discussed include the climate, oceans, global warming. The "Field Trips" listing includes a listing of

	different web sites relating to atmospheric information for K-12 schools. Some of these sites include NASA's K-12 Internet Initiative, Blue-Skies, the Weather Underground, and the Cooperative Institute for Meteorological Satellite Studies.
Blue-Skies	http://groundhog.sprl.umich.edu/blueskies.html This page allows you to download Blue-Skies software for both PC and Mac. Blue Skies is a unique graphical interface to the Internet with interactive imagery. This software allows you to easily connect to different weather servers, such as the Groundhog Weather Server at the University of Michigan, and view different weather maps of many states across the country.
CLIMVIS	http://www.ncdc.noaa.gov/onlineprod/drought/xmgr.html Graph and download data from the World's Weather Data Archive.
The Weather Processor	http://wxp.atms.purdue.edu WXP is a software package developed at Purdue University in the Department of Earth and Atmospheric Sciences. It is intended to be a general purpose weather visualization tool for current and archived meteorological data.

Environmental Resources

The United Nations Environment Programme	http://unep.no The UNEP's mandate is to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and peoples to improve their quality of life without compromising that of future generations.

26. GLOBE PARTNER BEST PRACTICES

Based on feedback from our Partners, GLOBE has identified six areas of successful implementation in the following categories: Curriculum Integration, Data Reporting, Regional Collaboration, Working with Scientists, Securing Private Sector/Foundation Support and School Selection/Recruiting Schools. The following document illustrates examples of successful implementation strategies in these areas.

Curriculum Integration:

Keys to success: Providing teachers the tools and information needed to integrate GLOBE into required teaching material; sharing to teachers how GLOBE can also fit into non science courses, such as social studies, foreign languages, etc. and sharing success stories so that others can follow schools' successful integration examples; using GLOBE for cross-cultural communication/learning; making GLOBE materials available to as many teachers as possible; and clearly outlining exactly where GLOBE fits into the curriculum so that it is obvious to teachers and they don't have to exert time and energy to figure it out on their own.

Czech Republic - Schools in the Czech Republic use GLOBE to integrate and connect various aspects of their curriculums. GLOBE is used to promote communications among schools both nationally and internationally. Each school director matches GLOBE materials with his or her school curriculum. TEREZA, the non-profit group that coordinates GLOBE in the Czech Republic, provides newsletters to GLOBE schools that include information about curriculum integration. This enables directors to share their experiences and helps schools implement and sustain GLOBE.

Cyprus - The GLOBE Program may soon be implemented at a nation-wide level in Cyprus. The Cypriot GLOBE Country Coordinator with support from the Ministry of Education and Culture is working towards incorporating GLOBE into their national curriculum for secondary education. Currently, the GLOBE Hydrology investigation has been incorporated in the Analytical Programs for Cypriot high schools, and there are plans for including additional investigations in the future.

Finland – GLOBE supports the Finnish goals of hand-on science and analysis, the teaching of foreign languages and cooperative learning. The national curriculum in Finland is decentralized, which allows GLOBE schools flexibility on how they incorporate GLOBE materials.

Japan - In order to improve school retention, GLOBE Japan is taking steps to better assist their teachers in intergrading GLOBE into their curricula. Successful examples of integrating GLOBE into different curricular subjects are widely disseminated. Teachers are also encouraged to utilize the newly implemented "Period for Integrated Study", a flexible period devoted to the inquiry process and to problem-based learning, for implementing GLOBE in their classroom. Successful examples of such implementation are also made available to all GLOBE teachers. Efforts are made to encourage teachers to engage their students in research projects that utilize GLOBE data. Finally, in an effort to reduce the barrier the English language poses to many Japanese schools, the GLOBE Teachers Guide, as well as the GLOBE data entry and data visualizations web pages, are being translated to Japanese.

Jordan – Friends of the Environment (FOE) administers GLOBE in Jordan. FOE has established "GLOBE ROOMS" in GLOBE schools where teachers and students keep their GLOBE materials. Teachers of various disciplines use the materials in GLOBE ROOMS to highlight aspects of their curriculum. For example, chemistry teachers use GLOBE because they can apply it to their local environments. Students find the hands-on GLOBE materials more meaningful than only reading about science in textbooks.

Nepal – The Nepalese found that GLOBE protocols positively correlated with the science and environmental books of their schools' level four and higher. Nepal's implementating agency, Environmental Camps For Conservation Awareness (ECCA), made a chart showing exactly where and how the correlations work so that schools and teachers quickly understand how GLOBE fits into the curriculum.

Data Reporting:

Keys to success: Having more than one GLOBE trained teacher in each GLOBE school; getting support of school administrations by including them in GLOBE conferences and workshops; holding refresher workshops for previously trained teachers; visiting GLOBE schools and helping them enter data for the first time.

Benin and Ghana – The Beninese and Ghanaian GLOBE Coordinators travel around their respective countries visiting GLOBE schools, meeting with school administrators to secure their support for the Program and helping teachers build confidence and overcome any challenges or insecurities they have with data reporting. Both countries hold refresher workshops on specific topics. Most schools have more than one GLOBE teacher so that they can support each other with implementation.

Croatia – Croatia was the first GLOBE country to invite school administrators/principals to participate in GLOBE workshops and meetings. This approach secured support from many of these administrators, which helped ensure that GLOBE teachers were given what they needed to incorporate GLOBE into their lessons. It also helped secure financial resources for the school to support the Program.

Hungary – Hungary invites local scientists to their workshops so that teachers understand the importance of student data for scientific research. The Country Coordinator holds refresher courses on specific aspects of the Program to strengthen the confidence and interest of teachers to continue GLOBE and, in particular, to report data.

Regional Collaboration:

Keys to success: Regional Partners working together to reach common goals; having a self identified "lead" country in the region that reaches out to neighboring countries with ideas for collaboration; developing a regionally relevant theme; holding regional conferences and workshops.

European Country Coordinator Committee – GLOBE Partners in Europe created the European Country Coordinator Committee (ECCC) to encourage regional collaboration among Partners throughout Europe. The ECCC allows regional partners to exchange information and

ideas about GLOBE activities throughout Europe and plan for regional collaboration. Specific topics addressed by the committee include school partnering, student-teacher exchanges and conferences, fundraising, scientific cooperation, and networking.

Norway – Norway approached GLOBE about developing a protocol to measure Persistent Organic Pollutants (POPs) in the Arctic environment for use by GLOBE schools in the Arctic. This issue is particularly relevant to the region and minimal data exists. Norwegian scientists developed the protocol, and GLOBE Norway raised funding to support workshops with representatives from GLOBE countries throughout the Arctic region – Canada, Finland, Iceland, Sweden, Russia and the United States (Alaska). Now Arctic GLOBE schools are studying the Arctic environment using both GLOBE and the POPs protocols.

Estonia - Estonian GLOBE schools are tightly involved in the regional collaboration of GLOBE schools. Several schools collaborate with twin schools in Norway, Latvia and Finland. Many schools participate in a regional phenology project under the guidance of Norwegian scientists.

The regional collaboration was highly promoted during the regional GLOBE Learning Expedition of Nordic and Baltic countries, held in August 2001 in Kääriku, Estonia http://ael.physic.ut.ee/kaariku. The event, organized by GLOBE-Estonia and supported by the US Embassies in Copenhagen and Tallinn, brought together over 230 GLOBE students, teachers and scientists from Estonia, Latvia, Lithuania, Poland, Norway, Sweden, Finland, Iceland and USA. Ten international expedition groups investigated the natural environment of Kääriku, using the GLOBE protocols and instrumentation. The gathered data were promptly entered to the GLOBE data server (see "Estonian Learning Expedition, Kääriku, EE" in the list of Estonian schools in GLOBE Web site).

Following on last year's successful event, GLOBE-Norway organized the 2002 regional GLOBE Learning Expedition in Vang, Norway. The event brought together over 350 participants from 7 countries throughout Europe.

Jordan - GLOBE Partners in Jordan, Lebanon and Bahrain initiated a regional Student Research Hydrology Project from March to June 2002. The goals of the study were to: 1) conduct a study comparing seawater quality in the Middle East Region (Arabian Gulf, The Red Sea, and The Mediterranean Sea); 2) develop scientific and technological awareness among students to improve their educational research; and 3) determine the effect of pollutants, such as sewage and industrial waste, on seawater. The study involved four coastal areas: Industrial, Touristic, Urban, and Ecologically Protected areas. In July, students and teachers from Jordan, Lebanon and Bahrain convened for a regional conference in Lebanon to discuss findings and results, and GLOBE Egypt participated as an observer. From this ongoing study evolved a similar regional student research project addressing Land Cover.

United Kingdom - Internationally, GLOBE-UK has developed links with GLOBE in Estonia, the Czech Republic, The Netherlands, Norway and Poland for a new e-learning project. The six-nation partnership has successfully attracted EU funding through the Minerva strand of the Socrates program. The project will develop e-learning materials for use in schools, based on GLOBE data but with the emphasis on learning activities. The final products will be launched at an international conference in Estonia in September 2003 with a new website and CD-Rom. The project also involves GLOBE teachers, both in helping to develop the new materials and in testing them in the classroom. Any teacher in the UK - at primary or secondary level - who is

interested in finding out more about this exciting development in e-learning should contact the GLOBE Office for further details.

HBCU Initiative - GLOBE has had tremendous success with joint research projects over the years. For example, a handful of the Historically Black Colleges and Universities (HBCUs) and several African countries are participating in the worldwide GLOBE effort to link the United States and Africa in developing and deploying strategies to increase the collaboration and cooperation among HBCUs, GLOBE coordinators, and African universities with a long term goal of addressing the under representation of minorities in science, mathematics, engineering and technology global enterprise**.**

Working With Scientists:

Keys to success: Inviting university research scientists to help train at in-country teacher-training workshops; asking scientists to serve as mentors to GLOBE students and teachers; getting scientists involved in implementation of GLOBE.

Arctic POPs - Norwegian scientists from the Norwegian Institute of Atmospheric Research (NILU) have designed a POPs protocol for GLOBE schools throughout the Arctic (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States). The measurements provide the environmental research community a useful data set covering new POP levels in the Arctic. Results will be published in international scientific journals.

Thailand: Two schools in Thailand are working closely with NASA soil scientists on the GAPS modeling project. Also, three university science faculties are involved with GLOBE-Thailand and are including GLOBE in their Teacher-Training Program. GLOBE Thailand conducted a workshop involving 10 GLOBE schools and local GLOBE scientists. The participants shared ideas about encouraging student research and student-scientist collaboration research.

Hungary: Hungarian scientists from Hungarian universities are working with the Country Coordinator in organizing the GLOBE Program, espically conducting lectures for their teacher trainings.

Czech Republic: The GLOBE Program in the Czech Republic established a Scientific Board in 1996. Eleven scientists and professionals from different natural sciences have joined the Board. The Board works with both teachers and students to interpret data and process the results.

Poland: The GLOBE Program in Poland established an Advisory Board in September 1999. The main task of the board is to carry out lectures during workshops and to supervise content-related issues of the program. Teachers and students can address questions to the members of the board using email or telephone. In the future, the board will work on adjustment of the GLOBE program to the Polish curriculum. The board consists of the following persons: a specialist in geophysics from the Institute of Geophysics of the Warsaw University - investigation of atmosphere and GPS; a hydrologist from the Institute of Geophysics of the Polish Academy of Science - investigations on hydrology; a specialist in remote sensing from the Environmental Information Center UNEP/GRID-Warsaw - investigations on land cover and satellite images; a specialist in phytosociology from the Institute of Phytosociology of the Warsaw University - investigations on biology, specialist in soils from the Institute of Soils of the Warsaw Agricultural University - investigations on soil; a specialist in teaching from the Ministry of

Education; a specialist in ecological education, internet and also the national coordinator of the program from the Environmental Information Center UNEP/GRID - Warsaw.

Securing Private Sector and/or Foundation Support:

Keys to success: Being proactive; inviting companies and foundations to GLOBE related events to see the program first-hand; developing relationships with decision makers in the organizations; finding matching support from government or other agencies; partnering with other GLOBE countries to strengthen proposals and resources; and to appeal to organizations that fund regional activities (Also see *"Private Sector Support for GLOBE International Partners"* section of the Implementation Guide)

Cyprus- GLOBE in Cyprus is currently implemented under the auspices of the Cypriot Ministry of Education and Culture. The Ministry is providing funds for purchasing equipment for public schools that join the Program. In addition, the GLOBE Country Coordinator is seeking private sources of funding. Recently he was successful in securing 3,500 CYP from the Cyprus Telecommunications Authority, a major private Internet provider for the country. The funds were used to support an international GLOBE train-the-trainer workshop for Europe and the Middle East held in Nicosia, Cyprus, September 23 – October 1, 2002. The same company may also contribute funds for supporting new schools joining GLOBE.

India – GLOBE in India was successful in securing a 12 million-rupee grant from the World Bank. The funds will support their initiative to train 800 schools in 8 states throughout India.

Norway - The SAS and Coca-Cola Environmental Foundation have contributed over $5,000 for GLOBE school-to-school collaboration between Norway and Estonia.

GLOBE Country Coordinators from the Czech Republic, Estonia, Holland, Norway, Poland and the United Kingdom were successful in securing a grant (Minerva) under the European Union's Socrates Education Programme. Minerva is aimed at open and distance learning, linking information and communication technologies in education.

School Selection/Recruiting Schools:

Keys to success: Competition, pilot programs, and geographic distribution. (Also See "School Selection and Support" section of the Implementation Guide)

India - Prospective GLOBE schools are personally approached by the coordinating agencies with information about the GLOBE program. This is followed up with workshops for the Principals of these schools where detailed presentation about salient features of the program are made by the coordinating agencies. The benefits that are likely to acquire to the schools are also explained to the Principals. Alternatively, the coordinating agencies send detailed letters to the School Principals outlining the salient features of GLOBE program and inviting them to join it. Once the schools express interest, they are enrolled in the program and the Principals are advised to nominate one or more Teachers, who are interested in conducting the scientific measurements, to co-ordinate this program in school.

India has adopted the following criteria for school selection:

- Geographical spread of the schools;
- Previous experience of participation in/conducting environment programs;
- Availability of hardware;
- Interest expressed by the school Principal;
- Access to the Internet;
- Motivational level of the concerned teachers.

United Kingdom - United Kingdom conducted a one-year pilot on GLOBE with about a dozen schools to determine if and how GLOBE fit into the curriculum before they decided to offer GLOBE to the participating UK schools. The conclusion was positive, and now the UK has over 300 GLOBE schools.

Sweden - An invitation to join the GLOBE program is sent annually to all schools via Agency newsletters. Schools can also get the information from the National Agency.

Greece - GLOBE schools in Greece have been selected through a nation-wide competition. Objective criteria were set in order to best evaluate the proposals submitted by interested schools. The selection process identified 24 schools (since then one additional school has been added) to reflect a wide geographic coverage of Greece. The schools selected also represent all major levels of the Greek Education system (i.e., the primary, secondary levels, and the technical secondary level). Government funds were use to establish Internet access, and to purchase computers and equipment for all public schools. Private schools were responsible for their own expenses.